Story Pictures of Transportation

BY JOHN Y. BEATY

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STORY PICTURES
OF
TRANSPORTATION AND COMMUNICATION

THE PRIMARY SOCIAL STUDIES SERIES

STORY PICTURES OF TRANSPORTATION AND COMMUNICATION

By
JOHN Y. BEATY
Author of
Story Pictures of Our Neighbors
Story Pictures of Farm Animals
Story Pictures of Farm Foods
Story Pictures of Farm Work

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Long Ago and Now

What a wonderful world this is! We fly in the sky, we sail on the water, we drive and we ride over the land.

Each year the airplane, the ship, the automobile, and the train are made to travel faster and still faster. Each year they are made to give us more comfort and more speed.

Long ago, people did not have any of these things. Travel was slow and hard. Now it is swift and easy.

This book will tell about the ways we travel now and how people traveled many years ago. It will tell how goods were carried from place to place and of the ways they are carried now.

The carrying of people and their goods is called transportation.

While people were finding better ways to travel, they were learning more about the sending of messages. Today we get news quickly. The mail, the telephone, the telegraph, and the radio bring messages to us from all parts of the world.

The sending of messages from one place to another is called communication. We shall find out about communication in this book, too.

In long-ago times there were few of the things we have today.

There were people and animals, strange plants and trees, land, water, and sky. But there were no cities, no roads, and no bridges. There were no trains or busses for people to ride in. They had to walk wherever they went.

When people wanted to bring anything to their homes, they carried it or dragged it on the ground.

In those days boys and girls and their parents did not know anything about other countries. They knew very little about the people who lived near them. They were afraid to meet strangers. Most people stayed near their homes and went only far enough away to get food.

People knew nothing about the world except what they could see. They were afraid of animals, of the weather, and of everything they could not understand. They did not like any people who were strangers to them.

There were few ways of sending messages to anyone, and there were few messages to send. No one could read words or write them. There were no postmen. There were no radios, no telegraphs, and no telephones for sending messages.

It is different now. Many of us have friends far away, even in other countries. But we get messages and news from them very quickly.

Little by little, men found new ways to make travel easier. As they traveled, they told one another about the different places they visited. These trips taught them many things they had not known before. They were less afraid of strangers.

Strangers began to trade goods with each other. Soon men and women had new kinds of clothing to wear. They had new kinds of food to eat.

It became easier for people to talk and write to each other, too. They could ask travelers to carry messages for them.

All of this was long ago when no one dreamed that some day men would invent the kinds of transportation and communication we have now. It took many years and the work of many people to give us these things.

Let us go back to the time when men had no way to travel except to walk. We shall begin the story there.

Travel on Land

How Early Men Traveled

It was one morning many thousands of years ago. Not a train, streetcar, bus, automobile, or truck could be heard or seen. No airplanes flew overhead. There were no houses or schools or churches.

Four people walked through the woods. They were a man, a woman, and two children.

They walked slowly. Each one was carrying something. They were going to a new place to live.

The man always kept a little ahead of the others. He must keep them safe. A long spear was in his hand and a stone knife hung at his side.

He kept watching ahead of him and on both sides. He was looking for some animal that he might kill for food. He was watching, too, for unfriendly people who might harm him or his wife or children.

The woman seemed to be very tired. She bent forward as she walked. She was carrying a baby on her back. She was dragging a heavy bundle along the ground.

Close behind her mother came a tiny girl carrying a load, too. She walked straight, for on her head was a huge bundle of sticks. These would be used for building a fire.

A boy followed his sister. Like the mother, he bent forward as he walked. A heavy animal which his father had killed was on his back. The animal would be used for their food when the family stopped to rest that night.

This tells how people of long ago traveled on land. They had to walk everywhere they went. They had to carry their loads in their arms, on their heads, or on their backs. Sometimes they dragged their loads along the ground.

Early Men and Their Loads

Bob and Bill were studying in school about the people of long ago. Whenever they had to carry something, they thought of the hard ways people used then.

When Bob carried home a loaf of bread for his mother, he thought, "This is the way the early men moved all their small things from place to place."

One day Bill was carrying his scout pack on his back.

"This is my dead animal," he laughed.

Father said, "Many people of long ago carried things on their heads. Why don't you try that?

"In Mexico, in parts of Africa, in the Philippine Islands, and in other countries, people still carry things that way."

The boys tried to carry bundles on their heads. They found that it was not easy. The loads would fall to the ground if they did not hold them.

Bob and Bill found it easier to carry things on their backs with straps around their foreheads.

Indians often carried their food and blankets that way. Part of the weight was on the back, and part was carried by the head. Loads do not seem so heavy when they are carried like that.

The people of long ago wanted better ways of carrying things. As time went on, they learned new ways which made transportation easier. They learned to carry heavier loads.

They had found it hard to carry many small things at one time. At last they thought of putting all the little things in a skin. This made the first pack.

Bob and Bill tried this way, too. They used a sack for their pack.

"Oh," said Bob, "how hard the first men must have worked! I am glad that there are better ways to carry things now."

"How would you like to walk about the country every day hunting your food and carrying it home?" asked Bill. "I'm glad food comes to us in trains and trucks."

Better Ways to Move Loads

One day a man who was hunting killed a deer. He couldn't carry all of it home because it was too heavy. When he came back the other part of the deer was gone. A wild animal had carried it away.

The next time the man killed a large animal, he broke a strong branch from a tree and rolled the animal onto it.

He found that he could pull the branch along the ground easily. In this way he could take the whole animal home in one trip. A branch used in this way is called a drag.

After men learned to use the drag, they put two sticks side-by-side and placed the load on the two sticks. They fastened a piece of vine to each stick and so pulled the load.

Two sticks or logs used in this way for moving things are called skids. Skids are still used for moving loads.

Bob wanted to pull a load on skids to see how easy it would be. The skids he used were two pieces cut from the branch of a tree. He put his pack on the skids.

Then Bob tied a rope to the skids and put the rope around his body. He found that he could pull the load easily.

The early men, too, found that using skids was an easier way to transport loads.

Bob and Bill were interested to hear their father say, "The early men had only a few ways in which to move things. Just think of the many kinds of transportation we have now!

"When we buy bananas at the grocery store, we do not stop to think what a long, long way they have come to us. We do not stop to think of the many people who have worked to bring them here. We do not think of the many kinds of transportation used in moving them.

"First, men carried the big bunches of bananas on their backs. Then a small train took the bananas to a big ship. The ship brought them to America. A train brought them from the ship to our town. A truck hauled them to the store."

"And I carried them in a bag from the store," said Bill.

"And then we rode home in Father's automobile," added Bob.

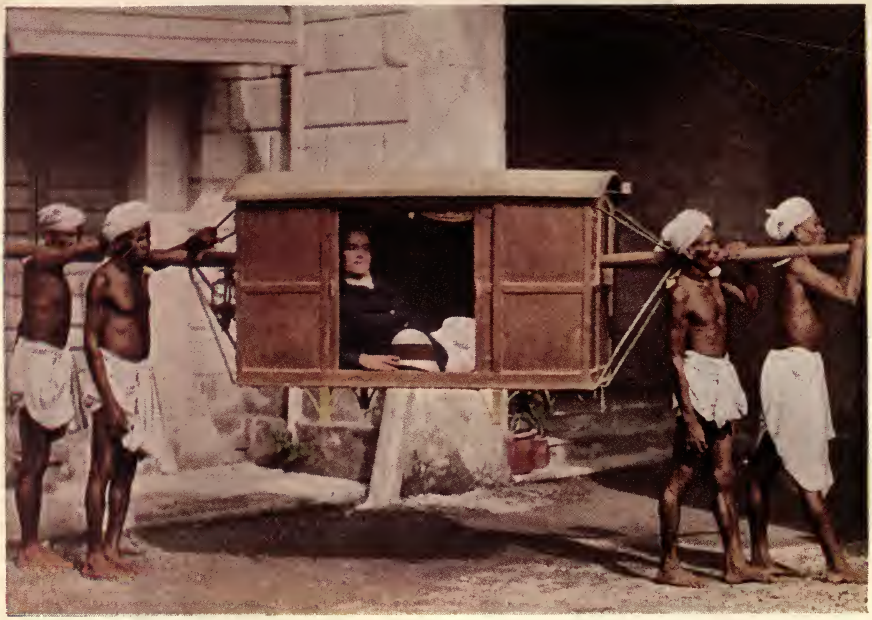
Father explained how someone thought of another way to carry loads. Poles were used to bring home animals that had been killed on hunting trips.

First the hunters tied the animal to the center of the pole. Then two of them lifted the pole to their shoulders and found that the load was easier to carry in that way.

Once when several men were hunting together, one of them was hurt so badly that he could not walk. The other men had to carry him home.

This is how they did it. An animal skin was spread on the ground. The man was laid on the skin and the ends of the skin were tied to a long pole. Two men lifted the pole and carried the man home almost as the animal had been carried.

This was a litter. It may have been the first way in which a man ever was carried from place to place.



"Are poles ever used for carrying people now?" Bill asked.

"Yes," Father replied. "They are used in India, China, and in some other parts of the world. Chairs or little beds are fastened to the poles. People sit in the chairs or beds and have a comfortable ride."

"I think it would be fun to ride that way," laughed Bill.

Men Learn to Use Animals

"Why didn't the early men use animals for carrying their loads?" asked Bill.

"Men were afraid of animals at first," said Father. "Some animals had strong claws and sharp teeth. Many of them did harm to people.

"But some animals, such as dogs, made friends with men. Wild dogs came to men's homes to get food. People tamed the dogs by giving them food every day. So the dog became man's friend."

Early people learned to tame goats, pigs, horses, sheep, and cattle. They caught these animals by driving them into pens or deep holes.

Men found animals useful to them in many ways. The milk of goats and cows was good to drink. Pigs, sheep, and cows gave people meat to eat. People used the horses and oxen to pull their loads for them on skids, carts, and wagons.

Animals That Carry Loads

Until the time when railroad trains and automobiles were invented, animals were men's best helpers in carrying loads on land.

Even today, in some parts of the world the roads are so bad that people cannot use automobiles. In those places different kinds of animals still carry men and loads on their backs.

We think that cattle were the first animals men used for pulling loads. These cattle are called oxen.

After man invented the wheel, oxen pulled his carts and wagons. Not many years ago, when people first went to the western part of our country, oxen pulled their covered wagons.

People used cows, horses, and other animals, even dogs, to carry burdens for them. With the help of animals, people moved from one place to another.

Horses have been important helpers for hundreds of years. They have carried men and packs on their backs. They have pulled wagons and buggies and sleds.

Horses still carry people and their goods over the prairies and in the mountains.

In some places other animals are used instead of horses.

The most useful animal in the desert is the camel. There is very little water in the desert and the sand is hot. It would be hard to live in the desert without camels. Camels are good travelers. Their broad, thick feet are not burned by the hot sand, and they can go without water and food for a long time.

A camel can go for days without drinking because there are places near his stomach where water is stored. When the camel needs water, these places open and the water runs into his stomach.

For some time before a camel starts on a long trip, his master gives him plenty to eat. Some of the food changes into fat which is stored in the large humps on the camel's back.

When a camel cannot get food, he uses some of the fat from the humps.

The burro is a good traveler in the desert and in the mountains, too. How carefully he picks his way up and down the steep hills!

He walks along with his head close to the ground, watching for any loose stone which might make him stumble. No road or trail is too hard for him to travel safely.

In South America men use the llama on the mountains. Llamas can travel safely in dangerous places. Thick pads on their feet keep them from slipping even on ice or wet stones. Their coats of wool are so heavy that they can stand the coldest weather.

The llama, like the camel, can go a long time without drinking, and he eats very little food. Bushes or short grasses which other animals would not eat are all he needs.

Most boys and girls have seen circus elephants carrying people on their backs. In some parts of Asia and Africa, elephants pull or carry men's loads.

Elephants are very strong, and men have taught them to lift heavy things with their trunks. It is easy for an elephant to pick up a log. He puts his tusks under it, winds his long trunk around it, and carries it away.

Bob and Bill were greatly interested in learning how animals have helped men transport things.

Bob said to his father, "Dad, you said that dogs helped people transport things. Do you mean Eskimo dogs?"

"Yes," said Father. "Eskimos found that dogs could pull heavy loads when hitched to a sled.

"Their sleds have runners which slide over the snow and ice easily. Really, sleds are not very different from the skids which the early men used."

Men Invent Wheels

After men saw that logs could be made to roll easily on the ground, they put them under skids when very heavy loads were to be moved.

Logs used in this way are called rollers. They are used today under skids when houses or heavy machines are moved. The roller is carried from the back of the skid to the front after the load has been moved over it.

After a while someone thought of a way to have rollers that would stay in the same place under the load. This is how the wheel was invented.

Some people say that the wheel is the most important thing ever invented. We know that if there were no wheels, there could be no automobiles, trains, bicycles, or even carts or wagons. There could be no clocks such as we have today, or other things for which wheels are needed.

The first wheels were made from slices cut from the end of a log. In the center of each slice a hole was burned. A round stick, or axle, was put through two of these. Boards were fastened onto the axle, and the load was placed on the boards. That was the earliest cart.

Then men began to think of ways to make animals draw their carts for them. Yokes and harnesses were made so that the animals could pull the loads.

A harness was made from strips cut from animal skins. A yoke placed on the shoulders of the animals was used to help them work together. It was really a wooden collar.

Straps or ropes and a pole from the cart were fastened to the yoke. As the animals moved ahead they pulled the cart.

Many of the first carts were pulled by oxen. Some farmers in our country still use oxen.

In some parts of the world there are no good roads. In such places one may see two-wheeled carts like those used long ago.

These carts have big wooden wheels and are pulled by oxen. As the animals slowly move along, the heavy wheels creak with every turn.

After a time men learned to make wheels that were lighter but stronger than the pieces of logs which they used at first. This was done by cutting out more and more wood. At last wheels became only an outer rim with spokes and a hub.

Today most wheels are made of metal. A bicycle wheel is very strong, but it is so light that it can be lifted with one finger.

Two-Wheeled Vehicles

Any machine used to carry people or goods from one place to another is called a vehicle. An automobile is a vehicle. A bicycle is a vehicle. So is a truck.

Long ago, people used a vehicle called a chariot. It had two wheels and a platform with three sides around it. A man stood up in it to drive the horses. Chariots were used in war and in races.

Some vehicles are pushed or pulled by people. The wheelbarrow is one of these vehicles. The jinrikisha is another.

The wheelbarrow has only one wheel. We often use this vehicle for transporting sand or brick in our country. In China the wheelbarrow is used to carry people.

Jinrikishas are used in Japan and some other faraway lands. They are light, high carts. A man can pull a jinrikisha easily.

Carts, chariots, and jinrikishas have two wheels, one on each side. Some years ago men made a vehicle which had the two wheels one behind the other. This was the bicycle, a vehicle which a person pushes and rides on at the same time.

The first bicycle had no pedals. The rider sat on the seat and kept pushing against the ground with his feet. When he was going fast enough he could lift his feet and coast along.

Later, bicycles were made with one small back wheel, one very large front wheel, and two pedals. The seat was high and the rider was far above the ground.

The bicycles we use today can go fast, and they are comfortable to ride. Many people use them for traveling in countries where automobiles and gasoline are very expensive. Men, women, and children use bicycles in Europe more than they use automobiles.

Four-Wheeled Vehicles

Men used two-wheeled carts for a great many years. Then they made four-wheeled vehicles which would carry heavier loads and more people. Wagons were built for carrying loads. Coaches were built for carrying people.

Before coaches were made there were few ways in which to go from place to place. If a person were rich enough, he rode a horse. If he had no horse, he walked.

The first coaches were for kings and rich people. They rode in them when they called on friends or went on journeys.

One of the most famous old coaches is the one in which the king and queen of England still ride through the streets of London on special days.

There were some coaches in which anyone could ride if he paid a fare. These were called stagecoaches, and they were used as we use trains today.

Stagecoaches had regular routes, or stages, which they traveled. They carried baggage and mail, as well as people.

A ride in a coach was often interesting, but it was not very comfortable. The roads were rough, and the coach swayed from side to side. The coaches had springs of leather or metal to make them easier to ride in. But the passengers were bounced about over the rough roads, and they were glad when the journey ended.

Most coaches were pulled by four horses. The driver often had a helper called a postilion. The postilion rode on the left front horse and helped to guide the horses.

Before railroads were built in America, people used stagecoaches when they traveled from place to place.

Very few white people lived in the western part of our country at first. Most of them lived in the eastern part, in the states near the Atlantic Ocean.

The eastern people heard of the western country and some of them moved there. Much of the travel in the West was done in stagecoaches.

The men who drove the coaches or rode in them had many exciting adventures. Indians often stopped them along the way. Robbers sometimes dashed up on horseback and took the travelers' money.

Nearly one hundred years ago families began moving to the West in very large numbers. There were no railroads across the United States in those days. The people had to take as much food and clothing as they could, and furniture for their new homes. So they crossed the country in four-wheeled covered wagons.

These big wagons had high, wide wheels. Their sides were made of wood and the rounded tops were of canvas cloth.

Sometimes these heavy wagons became stuck in the mud. Often they had to be pulled through deep water. There were few roads and no bridges in the West in those days. Travel was not easy.

Covered wagons were sometimes called prairie schooners or Conestoga wagons. They were pulled by teams of horses, mules, or oxen.

Often several families traveled together. At night the travelers brought their wagons together in a circle to be safe from Indians and wild animals.

Bonfires were built in the center of this circle. Here people cooked their suppers. Afterward they told stories or sang. Then they went to sleep on the ground. In rainy weather the travelers ate and slept in their wagons.

Not all vehicles used years ago were as large as coaches or covered wagons. People had small vehicles called carriages or buggies. These smaller vehicles were drawn by horses and were used in towns and for short trips into the country.

Buggies were used as we use small automobiles today. The postman in the picture is using a buggy to deliver mail in the country. Most rural postmen use automobiles now.

Men's Helper—Steam

Since the time of the early men, people and animals had carried or drawn nearly all the world's loads on land. People had found only a few ways in which to make transportation easier. The wheel had helped more than anything else.

In the last two hundred years men have built machines to do the work which had been done by people and animals. As the years passed, better machines were built. Transportation became easier and faster.

One of the most important of these machines was the steam engine. James Watt, a Scotchman, was one of the men who first worked with steam engines. He knew that when water became very hot, it boiled and turned into steam. He saw steam push up the lid of a kettle when the water in it was boiling.

He thought, "If steam can push up the cover of a kettle, it can push other things."

James Watt found that he could make steam do the work that men and animals had done before. He made a steam engine which could pump water. Later other men worked with steam. They put steam engines on four wheels and so made the first locomotives.

George Stephenson, an Englishman, built one of the first locomotives. It was called the Rocket. It pulled the first passenger train ever made. Some people called the locomotive an iron horse because it was made of iron and did the work of a horse. It pulled loads along wooden or iron rails.

An American named Peter Cooper built a locomotive called the Tom Thumb. It was named after a very small but very strong man who lived many, many years ago in England. This tiny locomotive pulled a car and twenty-five passengers thirteen miles in one hour. Today some trains travel ninety miles in one hour.

Early Trains across America

A ride in one of the first American trains was an exciting experience. The little engine puffed along at twenty or thirty miles an hour. People said, "How powerful it is! How fast it travels!"

The cars were much like stagecoaches. There were no glass windows. Leather curtains were used to keep out rain and cold. Smoke covered the passengers, and sparks flew in every direction.

Some people were afraid at first that the iron horse might blow into pieces. In one train bales of cotton were put between the engine and the passengers so that the passengers would not be hurt if such a thing happened. People carried umbrellas to keep the soot off their clothes.

Years passed, and trains became larger, faster, and more comfortable. Machines were at last carrying men and loads, and carrying them better than they ever had been carried before.

All this was happening at the time when people were moving to the western part of our country in covered wagons. There were no roads between the East and the West except wagon trails.

People wanted an easier way to travel to the West. Often people in the West had to travel to the East. A railroad was needed to connect the eastern and the western parts of our country.

Two crews of workers started to build this new railroad. One crew of men started in California and worked toward the east. Another crew began in Iowa and worked toward the west.

Day after day and year after year each crew worked. They built farther and farther. Little by little, the two parts of the railroad came closer together. At last, after seven years, they met in Utah. The last spikes driven into the ties were made of gold and silver. They were sent by different states. The work was done!

It was a great day. All over the country, the news made everyone happy. At last the East and the West were connected. People would not have to spend weeks bouncing across the country in covered wagons or stagecoaches. Now they could make the journey by train in a few days.

Since that time, railroads have been built in nearly every part of our country.

Fast Trains of Today

Some locomotives built today are so large that they have twenty wheels under them. They pull heavy loads and go very fast. They are moved by steam just as the first locomotives were.

In the last few years a new kind of train has been built. This new train is called a "streamline" train.

Some streamline trains have steam locomotives. But many streamline trains are pulled by Diesel locomotives, which have engines very much like those in automobiles. Diesel engines burn oil and run very quietly. They turn machines that make electricity. The electricity turns the wheels of the locomotive.

Today's trains are very comfortable. Many of them are air-conditioned. In summer they are kept cool. In winter they are warm and pleasant. The windows are kept closed and no dust or soot can get in. People can keep clean even when they travel long distances in these air-conditioned cars.

In these new trains we can travel as comfortably as we live at home. We may read, listen to the radio, talk with other passengers, sleep, and eat. The seats are deep and soft. Some of them tip back so that we can rest as we ride.

It is fun to eat a meal on the train. Little tables spread with white cloths are fastened to each side of the dining car. A steward is in charge of the dining car, and he shows people to their tables.

At the end of the car is a tiny kitchen where cooks prepare the food. Waiters in clean white coats carry it to the tables. They are very polite to everyone.

Sometimes when people go on a trip they sleep on the train at night. A man called a porter changes the seats into comfortable beds called berths.

When he has the bed ready, the porter hangs two long curtains in front of it.

At each end of the car there is a room where one may wash and dress in the morning.

Freight Trains

Passenger trains carry people and their baggage. They carry mail and express, too. Freight trains carry goods only. They do not often run as fast as passenger trains. They stop at towns to leave cars or goods and to pick up loaded cars.

Freight trains carry food for us to eat, furniture for our houses, and clothing for us to wear. They carry tools and machinery for farms and factories, and other things.

Some freight trains are very long. One freight engine often pulls fifty cars or more. Behind the engine is a car called a tender. It carries the coal and water needed to run the locomotive.

There are many kinds of freight cars, built to carry everything we need. Cars that carry heavy machinery are called flatcars. These do not have any sides or tops. Tank cars carry oil or milk. They are really big tanks on wheels.

Fresh meat, fruit, and other foods must be kept cold when taken from one town to another. These things are transported in refrigerator cars. Ice is put into these cars, just as ice is put into refrigerators in our homes.

There are boxcars in which many things are carried. There are cars which are built to carry live poultry. Other cars carry cattle, sheep, and hogs.

Railroad Workers

It takes many workers to run a train. Every train has at least five men. The man in charge of the train is called the conductor. He gives the orders to start and to stop. Everyone on the train must do as he says.

The engineer is the man in charge of the locomotive. He turns on the steam to make the train go. He pulls a lever which makes the brakes stop the train.

The engineer looks far down the track and watches every signal flag and light. In the daytime and in the dark night, too, he must guide his train safely. He must see that no harm comes to his train, the passengers, or the goods which the train is carrying.

A fireman rides in the cab of the locomotive and helps the engineer. His work is to put coal into the firebox to heat the water and make the steam.

Every train has two brakemen. One of them rides at the back of the train, and the other rides at the front. If the train stops for a long time, these brakemen must walk down the track to stop other trains coming from in front or behind. They wave red flags as a signal. At night they wave red lanterns.

These brakemen have other work to do, too. They help get the train ready for its trip and then help put the cars away when the trip is over.

If the train has a dining car, many more helpers are needed. The steward, waiters, cooks, and a pantryman all work to give the passengers food on the train.

If there are sleeping cars on the train, a porter is needed to take care of each car. Porters make up the berths at night and help the passengers with their baggage. A special conductor takes the tickets in the sleeping cars.

There are many other men who work so that trains can run. One of the most important of these is the dispatcher. He tells the trainmen on his section when to leave the stations. Each train must leave at a time so that it will not be in the way of other trains on the same track.

The railroad tracks are kept in order by men called section hands. These men ride in small cars called handcars. When they come to a place where water has washed away some of the ground under the track, they fill in the hole and make the track safe again.

Track walkers go along the tracks every day. Each one carries tools so that he can tighten bolts and drive in any loose spikes that he finds.

Other railroad men work in the stations. A ticket agent sells tickets. A baggageman takes care of trunks and suitcases. An expressman handles packages and boxes.

Transportation in Cities

Railroads made it easy to get from one town to another. But as the towns grew larger, people had long distances to go right in their own cities. Someone said, "We need little railroads now to take us around our city."

So street railways were built. Tracks were laid in the streets, and horses pulled small cars over them.

But horsecars moved very slowly. A faster way of getting about the city was needed. So a different kind of streetcar was built. It was called a cable car because it was pulled by a cable instead of a horse.

The cable was a steel rope made like a belt. It ran through a pipe in the ground between the rails. An opening or slot was left in the top of the pipe. A steam engine in a powerhouse moved the cable.

The driver of the cable car could pull a handle, and a hook would reach through the slot and grip the moving cable. The cable made the car move forward. When the driver wished to stop the car he could pull the handle and the hook would let go of the cable.

Cable cars are still used in San Francisco where there are steep hills. Cars can go up steep hills more easily when they are pulled by cables than when they are moved by electric motors.

In the last hundred years a new kind of power called electricity has been used for more and more things. People used it at first for lights and for sending messages. Then they began to use electricity for transportation.

Michael Faraday, an English inventor, found a way to make electric power. Thomas A. Edison, an American, invented a motor that was used to make streetcars go. Today electric motors do many kinds of work for us.

Thomas A. Edison invented many different ways to use electricity. The motor he invented has helped us to have electric streetcars, trolley busses, elevated trains, subway trains, and electric railway engines. The picture shows a fast streetcar of today.

Electricity is made by generators in a powerhouse. It goes from the powerhouse through wires above the tracks. Then it goes through the streetcar motor and makes the car run.

Electric streetcars are often called trolley cars. The electricity that runs them is brought by trolley poles and trolley wheels from the wires above.

A trolley pole reaches from the top of the streetcar to the wire. At the top of the pole is the trolley wheel.

Some cities have trolley busses. They look like other busses except that they have two trolley poles.

Electricity must travel in a circle. In a streetcar it comes to the car on the trolley pole and returns along the tracks to the powerhouse. In trolley busses the electricity reaches the bus through one pole. But as it cannot return on tracks, it returns to the powerhouse on the other trolley. That is why these busses have two trolley poles.

Because trolley busses do not run on tracks, they can come to the side of the street to let people get on or off.

Elevators

In cities many of the buildings are tall. People would get very tired if they had to walk up and down the many flights of stairs. So elevators have been built to carry them up and down.

Elevators are run by electricity now. At first they were run by steam. Then they were called up-and-down railways because they carried people up and down in buildings.

Before we had elevators buildings were built only a few stories high. People had to walk up and down stairs then, and they did not like to go up very many stairs.

As elevators were made better, taller buildings could be built. Now many office buildings and hotels in America are more than twenty stories high. Some are much higher than that. In very tall buildings it takes many elevators to carry people up and down.

Elevated Railways

In great cities many people go to work at the same time in the morning. Many people start for home at about the same time in the evening. These times of day are called rush hours.

As cities grew larger, trolley cars could not carry all the people in the rush hours. New ways had to be found.

Elevated trains, subway trains, and busses have been built, and they help to carry the crowds of people.

The first elevated railroad was built about sixty years ago in the city of New York. People called it the "L." The tracks were laid on steel posts high above the streets.

At first steam trains ran on these tracks. Much dirt and many cinders fell down on the people in the streets below. Clouds of black smoke filled the air. Now electricity is used for power.

"L" trains are the only vehicles that run on the elevated tracks. There are no automobiles, busses, or people to get in the way of these trains. That is why they can go faster than streetcars.

Stations are about four blocks apart. The stations are really platforms where people get on and off. Steps go down from the platforms to the streets.

In some large cities trains run in tunnels under the ground. These trains are called subway trains, and the long, dark tunnels in which the trains run are called subways.

Subway trains help to transport people to and from work every day. Many other people ride in them when they want to get somewhere quickly. Subway trains travel very fast.

The subway station is under the ground, too. People walk down steps to get to the station just as if they were going to the basement of a building. At some stations there are elevators to take people up and down.

It is not dark in a subway station. The walls are white, and electric lights burn all the time. It is easy to find the way. Signs tell which way to go. The names of the stations are painted in big letters where everyone can see them.

The subway tracks are below the floor of the station. The subway train comes into the station with a rumble and a roar. It stops by the platform. The doors fly open. Some people walk off the train. Others walk on. There are no steps to climb from the platform to the train.

Then the doors slide shut, and the train rushes on its way again.

Electric Locomotives

We have learned that electricity is used in the cities for elevators, streetcars, elevated trains, subway trains, and busses. Electricity is used to pull some railway trains, too.

In some places the electricity is brought to the train on wires above the tracks. One car of the train is called the electric locomotive, or power car. All the electric motors are in that one car. The power car pulls all the other cars.

Electric locomotives are often used in the mountains in our country and in other countries. Switzerland, a country of many mountains, uses electric locomotives.

Electric locomotives run quietly. They do not burn coal, and so there is no smoke. Sometimes they pull steam trains in and out of cities. Cities like these locomotives because they do not make any noise or smoke.

Horseless Carriages

Steam trains were used for traveling from town to town. Streetcars helped people to get from place to place in the cities. But when people made short trips into the country or to other towns near by, they had to use a carriage pulled by horses. They wanted a better way.

Several times men had made steam vehicles which would run over the streets and roads. One vehicle was a three-wheeled carriage with a round steam boiler on the front of it. It could travel two or three miles an hour.

But these steam vehicles were always frightening animals, running off the road, and breaking down fences. They filled the air with smoke and cinders.

At last someone invented an engine that could be run by gasoline. The gasoline engine was just what was needed. Then men began to make automobiles.

The first automobiles looked much like carriages. They really were just carriages with gasoline engines to run them. People called them horseless carriages.

The drivers of the first automobiles thought these cars very fine. We would think the early horseless carriages very queer if we had to drive them or ride in them today.

They were steered with a long handle instead of a steering wheel such as we use today. The cars had to be started by turning a crank. This was hard work.

The cars went chugging and sputtering down the rough, dusty roads. Often nails went through tires, let out the air, and made them flat. There were no signs along the roads to tell which way to drive.

But people had never had automobiles before. They did not expect their cars to start easily or to run well. They were glad to have this wonderful new way to travel.

People had to wear big goggles to keep the wind and the dust out of their eyes. Both men and women wore long coats to keep the dust off their clothes. These coats were called dusters.

There were no windshields or tops on the first automobiles. Women often tied heavy veils over their hats to keep them from being blown away by the wind. An automobile ride at ten miles an hour was an exciting adventure!

Soon large factories were building many automobiles. Cars were made better, and more people used them. In 1895, four cars were built in the United States. Now millions of passenger automobiles are built in the United States every year.

The first automobiles cost so much money that only a few people could afford to own them. Yet they were not nearly so good as the cars of today which cost very much less.

Automobile factories today build so many cars that they can build them well and make them cost less. In our country now there is one automobile for every five people.

The gasoline engine has helped the world very much. It has given us a better way to travel and a good way to carry goods. When automobiles began to be used so much, people built good roads and bridges. Because of the gasoline engine, men are now able to travel faster than they could ever travel before.

The automobile has made many different kinds of work for people to do. Many men and women help to build cars in factories. Some men work in filling stations where drivers buy gasoline and oil. Some work in garages where cars are repaired. Others drive taxicabs.

When the gasoline engine was first invented, people thought it could be used only in horseless carriages. But soon it was used for many other kinds of vehicles. Airships, airplanes, and motorcycles are run by gasoline engines. So are many boats, busses, trucks, and tractors.

The motorcycle looks like a big, heavy bicycle. But it can go faster than any bicycle. It is run by a small gasoline engine, and it uses very little fuel.

Motorcycles are made to carry one or two people. Men deliver packages to our homes on motorcycles. The police use motorcycles because they can go fast. Sometimes motorcycles are used for racing. What a noise they make!

Many people travel by bus in the cities. These busses run mostly on streets where there are no streetcars.

The bus in the picture is called a "double-decker." People can sit upstairs or downstairs. There are seats for seventy-two people.

Many passengers like to climb the little stairway and ride on the top deck where they can look down on the streets below.

City busses are used much as streetcars are used. A bus ride usually costs ten cents. Children who are not yet ten years old may ride for five cents.

In the country many children ride to school every morning in a school bus. Every afternoon the bus takes them home.

The largest busses used today are the ones which take people from one city to another, as trains do.

Many families have automobiles of their own. But often people need to hire an automobile to take them somewhere. These automobiles are called taxicabs. Taxicabs take people any place they want to go. They hurry along and do not stop to pick up other people.

Businessmen use taxicabs, too. Taxicabs take them quickly to any part of the city. When people come to a city by train, they often ride from the railroad station to a hotel in a taxicab.

The truck in this picture was made more than thirty years ago. It would look queer beside one of our new trucks. The trucks we see today are much larger and stronger.

When this truck was built there were only a few of them in our country. Then railroads carried most of the freight. But trucks have been found so useful that thousands of them are built every year.

The big, strong trucks which travel on the roads today bring us food and many other things we need. They are the freight trains of the highways. Some of them travel as fast as passenger automobiles.

Many trucks travel long distances. They travel all day and all night. Two drivers go with each truck. One man drives while the other man sleeps in a bed in the truck. In this way drivers can keep their loads moving all the time and deliver the freight quickly.

The gasoline engine is used in another machine called a tractor. This machine helps men do many kinds of hard work. The farmer uses it to plow his fields and to pull heavy machinery. Roadmen use tractors to smooth the roads in warm weather and to clean off the snow in winter. Men use tractors in the forests to haul great loads of logs which are to be cut into lumber.

Better Automobiles

Many changes have been made in automobiles since the first ones were used. People who rode in the early automobiles often were covered with dust or rain because there were no windshields or tops. Today cars are all enclosed. We need have no dust and only as much air as we want.

At first the engines had to be started by turning a crank. Today an electric motor called a self-starter starts the engine.

For a long time cars had brakes on only the two back wheels. Now automobiles have brakes on all four wheels.

The tires on the first automobiles were made of hard rubber. People who rode in these cars had bumpy rides. Today better springs and rubber tires filled with air make cars ride more comfortably.

We also have windshield wipers that clean rain from the glass, and heaters that keep the cars warm in winter.

Roadways

As automobiles were built to go faster, better roads, tunnels, and bridges were built for them. Today we see many kinds of vehicles traveling along the wide, smooth highways. It is hard to believe that just a few years ago there were only a few good roads in the whole world. Today we have paved roads all over our country.

Long before there were automobiles, the Roman people built good roads of stone. But for many years after that, roads were not paved and were often muddy. Wagons were made with wide wheels so that they would not sink into the mud.

Early settlers in our country made roads over wet ground by laying logs side by side. These log roads were called corduroy roads, because they were rough like corduroy cloth.

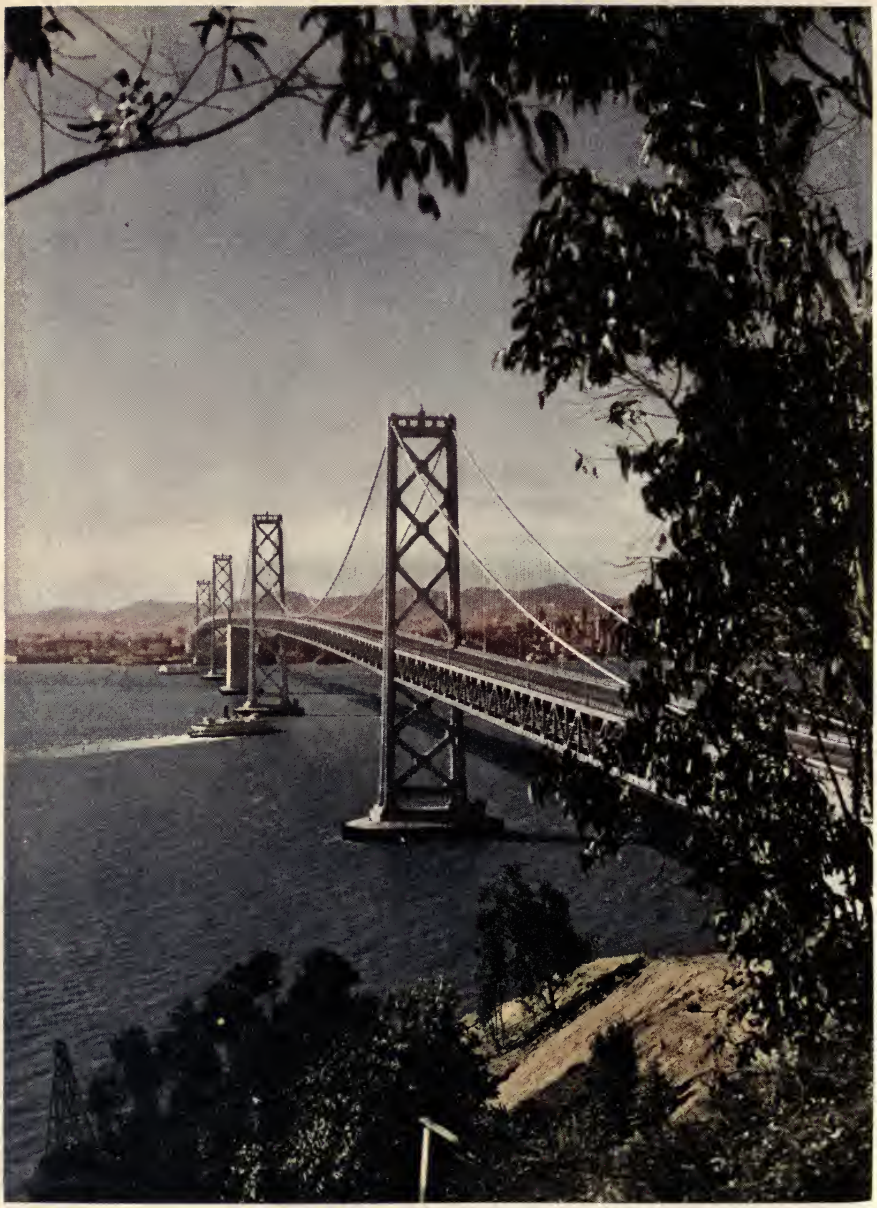
Over a hundred years ago, a Scotchman, John McAdam, found a way to make good roads of small pieces of rock. These are called macadam roads. Later, asphalt and concrete were used to make roads hard and smooth.

There are now so many automobiles, and they travel so fast, that laws have been passed to make travel safer. Drivers are told to be careful. Signs on every road tell people how and where to drive.

Tunnels and Bridges

Tunnels and bridges are built to make transportation faster, easier, and safer.

Sometimes roads or railways must go across mountains. It is shorter to go through a mountain than to go around or over it, and so great tunnels through the mountains have been built. This picture shows the openings to two railroad tunnels in the mountains of Colorado.



Tunnels are built under rivers as well as through mountains. One of the great tunnels under a river is the Holland Tunnel. It is more than a mile long and runs under the Hudson River from Jersey City to New York. Many hundreds of automobiles pass through it every day.

Most people cross rivers on bridges. One of the largest bridges in the world is the San Francisco-Oakland Bay bridge shown in the picture. It is eight miles long.

For many years people went in ferryboats from one side of the bay to the other. This bridge has been built so that people can drive in their automobiles or ride in trains across the bay.

The Golden Gate bridge in California is famous, too. And so is the George Washington Bridge in New York. This bridge has roads so that several cars can run side by side. It is high above the river and big boats can pass under it.

The End of the Story

And now the story of transportation on land has been told. It is a long story, and it goes back many, many years. Just think of all the different kinds of transportation which have been invented since man learned to make and use wheels!

One day Bob and Bill Williams were talking about the many uses of wheels.

"We shouldn't have bicycles to ride if there were no wheels," Bill said.

Bob and Bill know that there were many ways of traveling and of transporting things before wheels were first used.

Bob said, "Men walked wherever they went, whether it was a short journey or a long one. They transported their loads from place to place by carrying them or by dragging them. Many of those old kinds of transportation are still used today."

Bill went on with the story. "Yes, that is true," he said. "Then men found that animals could make transportation easier. They could pull bigger loads, and pull them faster. Animals were used to carry loads and people on their backs. First the animals dragged things. After wheels were used, they pulled carts and wagons."

"And so for thousands of years no one could travel faster than animals could run," added Bob.

The boys talked of the machines that are made now and of how these machines get their power from steam, electricity, or gasoline.

"Now it is fun to travel," said Bill.

The boys had heard their teacher say, "The world is growing smaller all the time." That means that it is becoming easier and easier for us to travel long distances. A distance of one hundred miles seems shorter now than it did years ago, because we can travel it so quickly.

Bob and Bill can go to faraway places and learn many things. They can meet people who have come from faraway places, too. Some of the clothes the boys wear and foods they eat come from other countries.

And all this is possible because of good transportation.

Water Transportation

Travel by Water Long Ago

The men of long ago found that they needed to travel on water as well as on land. When they went to new places to get food they often needed to cross rivers or lakes.

If the river was shallow, men could wade. When the river was deep, they had to swim. But they could not carry things they needed to use. They knew no way to get heavy loads across water.

Today most travel on land is done in vehicles of some kind. Most travel on water is done in boats. People walked on land before there were vehicles. People waded or swam whenever they traveled on the water before there were boats.

Swimming across a river was often very hard for the early men. Some rivers were cold and deep. The water in others was swift and dangerous. Men needed a better way to travel on water.

Men often saw logs floating in the water. They had used logs for skids on land. Now they thought of using logs on water.

Bob and Bill Williams talked of water transportation. "Let's see if we can ride on a log," said Bob. The boys tried riding on a log and found that it would carry them.

Bob and Bill sat on the log and paddled with their hands and feet just as the early men did.

A log will float on water because it is not so heavy as water. Anything that is lighter than water will float. That is why steamships do not sink, even with the heavy loads they carry. They are much lighter than the water it would take to fill them.

After men learned to ride on a log, someone fastened several logs together to make a raft. People found that a raft would carry a heavier load than one log. And so they began to use rafts instead of single logs. The raft was the first kind of boat that men had.

Even today people in some countries travel on water just as men did long ago. Their boats are very different from ours. They do not have the things for making boats which we have.

The rafts in the picture are made of a light wood called balsa. The people who use these rafts live in South America.

These people let the raft float with the current when they want to go down the stream.

They use long poles to make the raft go up the stream or from one side of the river to the other. They push against the bottom of the river with the poles, and this makes the raft move.

Boats with Paddles and Oars

Men found other ways to make boats. They dug out the inside of a log with sharp stones. Sometimes the inside of the log was burned out with hot stones or with fire. This kind of boat was called a dugout canoe.

Some American Indians made dugouts. In some parts of the world people still use dugouts like the one in the picture.

People liked the dugout canoe better than the floating log or raft. Things could be carried in a dugout, and a dugout could be guided more easily in deep water. This was done with a paddle.

Strange boats called gufas are made by some of the people in India and Africa. These boats are like big round baskets. Twigs are woven together and all of the holes are filled with tar or pitch. Some gufas are round frames covered with animal skins. Gufas bob around in the water and are very hard to steer.

In some parts of Asia people use the skins of goats and sheep to make their boats. These skins are blown full of air. Several of them are put together. Then light wooden platforms are fastened on top. People and loads are carried on rafts made in this way. Sometimes people use the skins to keep afloat in the water, just as we use water wings.

Some Indians learned to make canoes from the bark of the birch tree. Large pieces of bark were taken from the tree and fastened to a frame made of wood. Strips of leather were used to tie the bark to the frame. Every tiny hole was filled with a gum which is found on fir trees. This kept the water out of the canoe.

The Eskimo makes a canoe by stretching sealskin over a frame. There are almost no trees where the Eskimos live. So these people make a frame from the bones of animals. They stretch skin tightly over the frame. The skin is stretched over the top as well as over the sides and bottom. In the center, where the man sits, the skin is left loose. This Eskimo canoe is called a kayak.

After the Eskimo gets into the kayak he fastens the loose skin tightly around his waist. Then if the canoe should tip over, the water could not get inside the boat.

Eskimos do not swim. They do not like to get wet in the cold water of the North where they live. Kayaks turn over in the water easily because they are so narrow. Great waves often splash over the front of them. That is why the Eskimo covers the top of his kayak with skin.

The picture shows two kayaks, one on each side of a white man's canoe. The white man has been racing with the Eskimos. He covered over his canoe, too, so that no water could splash in on him.

Dugouts, rafts, canoes, kayaks, and rowboats are pushed through the water by poles, oars, or paddles.

Poles can be used when the water is shallow. But sometimes people have to travel on deep lakes or rivers. Then they use oars or paddles.

Our rowboats today are pushed over the water by oars. People often go fishing in rowboats, or they ride in them for fun.

Our canoes are very light boats, and they can go faster than rowboats. But they are not so safe. People have to sit very still in them or they will tip over. One man dips his broad paddle in the water and the canoe glides swiftly ahead. It does not make a sound. Sometimes two people paddle at a time, one in each end of the canoe.

In every one of these boats people have to do all the work to make the boats travel through the water.

The Wind Helps Man

As boats were built larger to carry heavier loads, men found it very hard to push them through the water. They tried to think of other ways to move these larger boats.

They saw that the wind often blew leaves and other things across the water. So they tried to use the wind to push boats.

We do not know just how men learned to use the wind to move their boats. Perhaps they fastened two long sticks to a raft and tied a skin between the sticks. The wind would blow against the skin and move the raft. Then men would not have to use poles to push the raft. In some way like this the first sailboat was invented.

An animal skin was the first sail. Now sails are made of cloth, or of grass or reeds woven together. The poles to which sails are fastened are called masts.

We think that the people who lived long ago in Egypt were the first ones to build large sailboats. Their ships had just one large sail. But the sail could be used only when the wind was blowing the right way. Sometimes a boat would not move at all because the wind was not blowing.

Later, men learned how to sail their boats even when the wind was not blowing the right way. When there was no wind at all, or when sails could not be used, the boats were pushed ahead by oars.

Some people called Phoenicians lived near the Egyptians. They knew just how to build boats and how to sail them. They were the best sailors and boatbuilders of their time.

The Phoenicians made beautiful purple cloth which people in other countries wanted. They took this cloth to different countries and traded it for other goods. In this way they became traders, or merchants.

Later the Greeks and Romans made good ships and sailed great distances in them.

The Egyptians, the Phoenicians, the Greeks, and the Romans had warships which were called galleys. Galleys were often two hundred feet long. They had both sails and oars.

Most galleys were made with more than one row of oars. The oars in the highest row were very, very long. This made them heavy and hard to pull. It took several strong men to pull each oar.

The men who rowed these ships were usually slaves, and they were chained to their seats. They sat in one place hour after hour and pulled at the heavy oars.

A man called a master sat where he could watch the rowers. He kept time with a hammer so that all the men would row together. Clank! Clank! went his hammer, and Dip! Dip! went the oars as the men pulled together.

Travel on the Atlantic Ocean

Some of the best sailors since the Phoenicians were the vikings from the northern part of Europe.

Viking ships were open wooden boats with oars and one square sail. Often the front of a viking ship was carved to look like a big dragon or some other animal.

Viking ships were steered by wide oars which were let down at the back of the boat. The vikings were large, strong men who rowed fast and well. They were not slaves but traders who loved to travel on the sea.

No seas were too stormy or too wide for the brave vikings to cross. About nine hundred years ago one of them came to America with his men. His name was Leif Ericson. We think he was the first person to come to America from Europe.

Five hundred years later, America was visited again by people from the other side of the Atlantic Ocean. They were led by Christopher Columbus, an Italian.

Columbus' ships were larger than the viking ships. They had several sails and more than one deck. By this time men no longer steered their ships with oars at the back. All large ships had rudders like those on ships today.

Columbus had three ships. They were named the Santa Maria, the Pinta, and the Nina. The smallest was the Nina, and the picture shows how it looked. Only eighteen men sailed on this ship. One of them was the first of Columbus' men to see land. The trip to America was a long, hard one. It took seventy days.

Packets and Clipper Ships

After Columbus discovered America, many people came here to make their homes. As more people came, more goods from other countries were needed.

Better and faster ships were built to bring these things. Some people crossed the ocean just to visit the new country and to learn about it.

Big sailing ships were built in America. They went back and forth across the Atlantic Ocean or along the shores of America. These ships were called packets because they carried packets of letters and other mail. They also carried passengers and freight.

Packets were the first ships to make regular trips across the ocean. They were the first ocean liners. Packets traveled faster than other ships had traveled. Some of them could make the trip across the Atlantic Ocean in sixteen days.

An even faster kind of sailing ship was being built. It soon became known as the clipper ship. Clippers were the fastest and most beautiful ships anyone had seen up to that time.

Clipper ships were longer and narrower than packets. Some of them were painted black with a red stripe around them. They had tall masts and many sails. They cut, or clipped, through the water faster than any boat had ever gone before.

Clipper ships carried goods and people across the Atlantic Ocean. America needed silk and tea from faraway China. The clipper ships brought these things quickly.

Ninety years ago gold was discovered in California. People wanted to get there as quickly as they could, and so they went in clipper ships. The journey was a long one, for the ships traveled around the southern end of South America. But it was an easier trip than going in covered wagons.

Ships Use Steam Power

The beautiful clipper ships that used the wind for power sailed the seas for only a few years. Other ships with a different kind of power took their place because sailors could not depend on the wind.

Men had learned to use the wind for fast sailing. They had made large ships with many sails, and they had learned to sail against the wind. This helped to make sailing faster and easier for them.

But sometimes the wind blew so hard in a storm that it broke the masts and tore the sails. Sometimes the wind did not blow at all. Then the ship could not move for days. If it carried fruit, the fruit would spoil. If it carried tea, the tea would lose its good taste.

We have learned how steam power was used to pull vehicles on land. At about the same time, men began to use steam power to move ships over the water.

A few years before the first steam railroad was started, a man named John Fitch first put a steam engine in a boat. There were paddles on each side of the boat. The steam engine dipped the paddles in and out of the water. This boat was called The Steamboat. It did not work well.

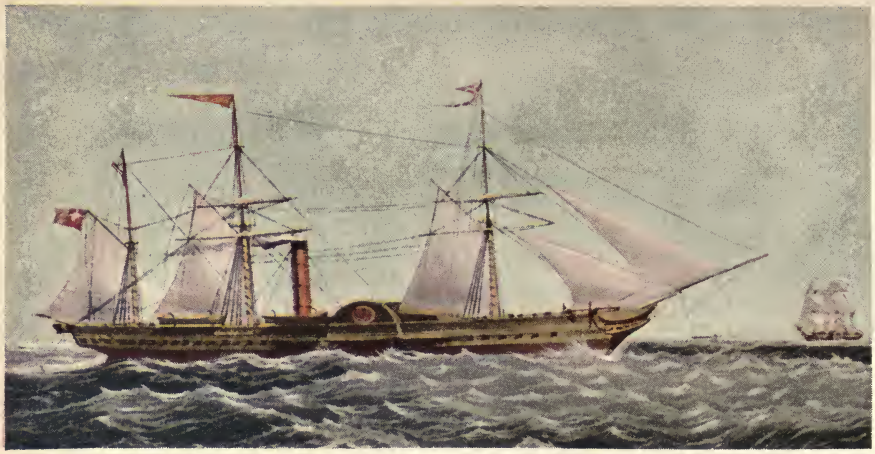
Later, Robert Fulton built a steamboat called the Clermont. When the day came for it to start, hundreds of people went to New York to see it.

Nearly everyone said, "It will not work. That boat will never move."

But others said, "It will make the trip. The steam engine will make it go."

The engine was started. Clouds of black smoke came from the smokestack. The paddle wheels began to turn, and the boat moved up the river at five miles an hour.

"Robert Fulton is right!" the people shouted. They were happy to know that boats could be run by steam.



Steamships Cross the Atlantic

Soon steam engines which burned wood were put into many ships. Most of these ships had sails, too. The sails could be used if the steam engines broke down or if the wood did not last through the trip. Many of the early steamships were really just sailing vessels with steam engines and paddle wheels.

The first steamship to make an ocean trip was an American ship named the Phoenix. Its first voyage was between Philadelphia and New York.

After this, ships with steam engines began to make longer trips. The Savannah was the first to cross the Atlantic Ocean. She sailed from America to England in twenty-six days. She used sails most of the time because she could not carry enough wood to keep the engines going for the whole trip. Some wood was saved so that when the ship came to England she could steam into port.

Some men in England thought it would be fine to have a company that would build steamships in which to take people across the Atlantic Ocean. The Cunard Steamship Company was started with four ships. These ships were two hundred feet long and could go ten miles an hour. The picture shows one of them.

These boats had both sails and paddle wheels. They burned coal instead of wood. The cabins for passengers were small because so much room was needed for coal.

This was the beginning of regular steamship travel on the Atlantic Ocean. Soon a ship called the Great Eastern was built in England. For forty years, she was the largest ship in the world. But it cost so much to run her that the owners lost money on every trip. The Great Eastern was made of iron. She had paddle wheels, sails, and a screw propeller.

A screw propeller has several blades like an electric fan. It is under the water at the back of the ship. As the propeller turns, it pushes the ship ahead.

When men began to build ships of metal they used iron. Steel is used today. It is stronger and not so heavy as iron.

In 1912 the whole world was interested in a big new ship. She was called the Titanic because she was the largest ship that had ever been built. On the first trip from England to the United States this great ship hit an iceberg and sank.

The Ships of Today

There are many ships and many different kinds of ships in the world today. They can be seen on rivers and oceans, on lakes, and in hundreds of harbors. They can be seen going through canals, too.

There are the great ocean passenger ships called liners. There are ferries, battleships, freight boats, barges, and tugs. On the larger rivers of our country there are river boats. Some of them still use paddle wheels.

Rowboats and canoes are used on many lakes and rivers in the summertime. Happy parties may be seen in launches, speedboats, and motor cruisers.

In faraway countries there are some very different kinds of boats. In China people use sailboats called junks. In the city of Venice in Italy there are many gondolas. Gondolas are really water taxis. They are moved with one oar.

This picture shows the Queen Mary. She is one of the largest and fastest passenger ships in the world. The Queen Mary was built less than one hundred years after steamships started going on regular trips across the Atlantic Ocean. Many, many changes in ships have been made in that time.

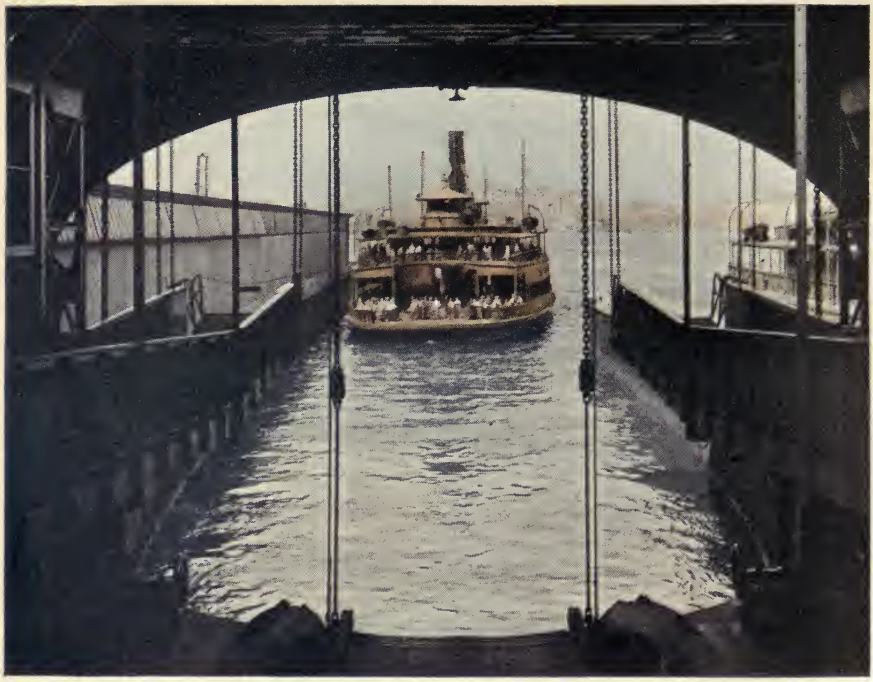
Great ocean liners such as the Queen Mary are like very large hotels. As many as three thousand people may live on a liner for several days or even weeks.

A great liner has two or three dining rooms, and decks where people walk and play games. It has a barber shop, a flower shop, stores where many things may be bought, a swimming pool, a room for church services, a theater, and many bedrooms. The bedrooms are called staterooms.

Liners have several floors, or decks. People who travel first-class have their rooms on the top decks. They have the finest food, too. They pay more than people who travel tourist class or third-class.

Because ocean water is salty and not good to drink, liners must take along much fresh water for the passengers. They must carry all the fresh fruits and other foods that will be used on the trip. In great kitchens and bakeries food is cooked and made ready for the people to eat.

Ships like the Queen Mary cross the Atlantic Ocean in less than five days. They travel about thirty miles an hour.



Ferryboats

Ocean liners carry people and loads long distances. But ferryboats travel only short distances. They carry people, automobiles, or railroad cars.

Ferries go back and forth across rivers and small bodies of water where there are no bridges. It is fun to sit in an automobile and ride across a river in a ferryboat.

Battleships

Most countries own large ships called battleships. These ships are made of thick sheets of steel. Many soldiers and sailors are carried on each ship.

Battleships help to keep countries and people safe when there is war. Some battleships carry airplanes. The top decks of these ships are used as landing fields.

Ships Used for Work

Many other kinds of ships are used for different kinds of work on the water. Some ships carry goods instead of people. They are called freight boats.

Freight boats that make regular trips are called cargo liners. They carry goods and a few passengers and travel fairly fast. Many foods, such as bananas and coffee, are brought to us from faraway countries by the cargo liners. They bring things we need, such as silk and rubber.

Freight boats that transport goods to any port in the world are called tramp steamers. They may go to Africa on one trip and to South America on the next. They will go to any port for which they can get a load of freight.

Some freight boats are made to carry only one kind of freight. Boats which transport oil or ore are built so that they can carry their loads in the best way.

Oil tankers are freight boats made to carry oil. They are called tankers because they have many large tanks to hold oil.

Some ships are made to carry iron ore or copper ore. They are called ore boats. There is a picture of an ore boat on page 125. In our country, ships like this are used only on the Great Lakes. They haul big loads of iron and copper ore to the mills.

Barges are the freight cars of the water. They are low boats with flat bottoms. They are used to carry loads of coal, stone, sand, and other things on rivers and canals. Some barges have motors, but most of them are pulled by tugs.

Tugs are strong, noisy little boats which pull other ships or turn big liners around. A liner cannot use its propellers near shore. It cannot make sharp turns when coming into a dock. Several tugs are needed to pull it and to push it.

Canals

In the early days the best way to travel a long distance was by water. There were few roads. Rivers are "roadways" which no one has to build. The early men could travel easily when they went by water.

Before any roads were built the early settlers in our country used waterways, too. People followed rivers and built homes and towns along their banks.

When people began to move west in America, they wanted an easy way to travel and to carry things to their new homes. The people who already lived west of the Atlantic states needed an easy way to send what they grew to the eastern cities. There were no trains then, and only a few roads. And so waterways were made.

When rivers do not go where people need them, big ditches are dug. They are filled with water from rivers or lakes. These big ditches are called canals.

5 times

Canals have been made so that boats can go from one river to another or from a river to a lake or ocean.

Many canals were built in the United States. The Erie canal was the largest. It was over three hundred miles long. By using it people found an easy way to go from New York to the Great Lakes.

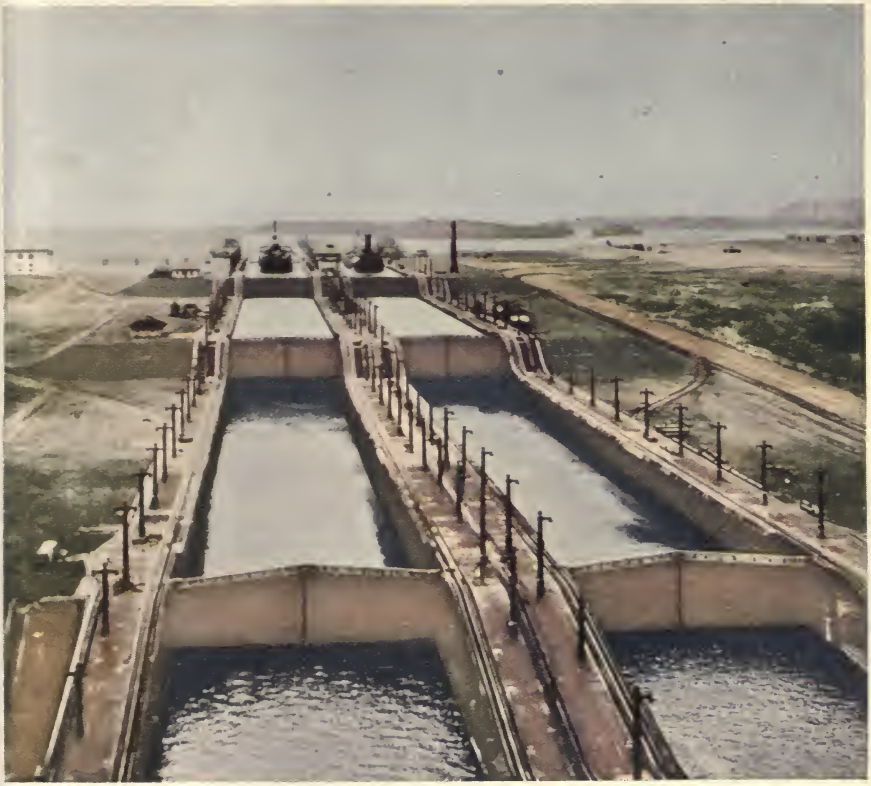
At first canal boats were pulled by horses or mules. They walked along the side of the canal on a path called a towpath. Now canal boats are moved by engines.

Some canals join seas and oceans and are very important. There is one between Asia and Africa called the Suez Canal. It is one hundred miles long. It is really just a large ditch through low, sandy ground.

Ships travel across the Mediterranean Sea, through the Suez Canal, and across the Red Sea into the Indian Ocean. Because of the Suez Canal, these ships need not make the long trip around Africa.

One of the most important canals in the world is the Panama Canal. It is a short cut between the Atlantic Ocean and the Pacific Ocean. By using it, ships do not have to go around South America.

The land through which the Panama Canal was dug is low near the oceans. But away from the shores it is high. For that reason, this canal is built with locks. These locks are like a water stairway. They take the ships over the high ground.



It was very hard to dig the Panama Canal. Panama is a hot, rocky country in Central America. At first, disease and impure water made many workers sick.

Thousands of men worked ten long years to make the canal. It cost the United States a great deal of money.

Between Lake Superior and Lake Huron there is a group of five canal locks. They make up the Saulte Sainte Marie Canal, or the Soo Canal, as it is called. More goods are moved through this canal than through any other waterway in the world.

A river joins Lake Superior and Lake Huron. There are high rapids in this river. The Soo Canal was built to take ships around the rapids.

Many ships are needed to carry grain, iron, lumber, and copper from the shores of Lake Superior to Chicago, Buffalo, and other cities. That is the reason why the Soo Canal is used so much. The canal can be used only eight or nine months of each year. In the winter it is frozen over.

The Soo Canal is about a mile and a half in length. Its locks are very long so that the big ore boats, like the one in the picture, can be taken through.

5 times

Safety Signs on Water

Lighthouses on the oceans and lakes show ships where to travel safely. They are like safety signs on land. Transportation on land is being made safer every day. The roads are wide and well made. There are many signs to show drivers where to go. There are red and green lights to tell them when to stop and when to go.

II

On the water, too, many things are done to make travel safe. Lighthouses are built to show sailors where there are rocks, shallow water, and other dangers.

Some lighthouses send out a steady light. Others have a light which flashes every few seconds. Foghorns give warnings in foggy weather.

In deep water where lighthouses cannot be built, small ships are anchored. They are really floating lighthouses. They are called lightships.

Then there are markers which float on the water and show sailors the way when ships are coming into a harbor. These markers are called buoys.

Some buoys have bells that ring or whistles that blow. Other buoys have lights that flash on and off. Some buoys are only wooden posts. But all of them warn sailors of rocks and shallow water. They are the safety signs of the sea.

Safe Ways at Sea

The radio helps to make water travel safe. By using radios, men can talk with people on shore and on other ships. Radios help most when there are fogs. Men who take ships over the sea must be careful in foggy weather. There is danger of running into shallow water or of hitting other ships when the pilot cannot see far ahead.

All passenger ships today carry enough lifeboats for all their passengers, and a life preserver for each person.

Lifeboats are small boats in which people may ride if the ship begins to sink. Life preservers are cloth belts filled with cork. If the people have to leave the ship, they put on life preservers to help them float in the water until some ship finds them. The ship's radio calls other ships to come and help.

Ships now have maps and instruments that help men go safely over the water.

Ships Long Ago and Now

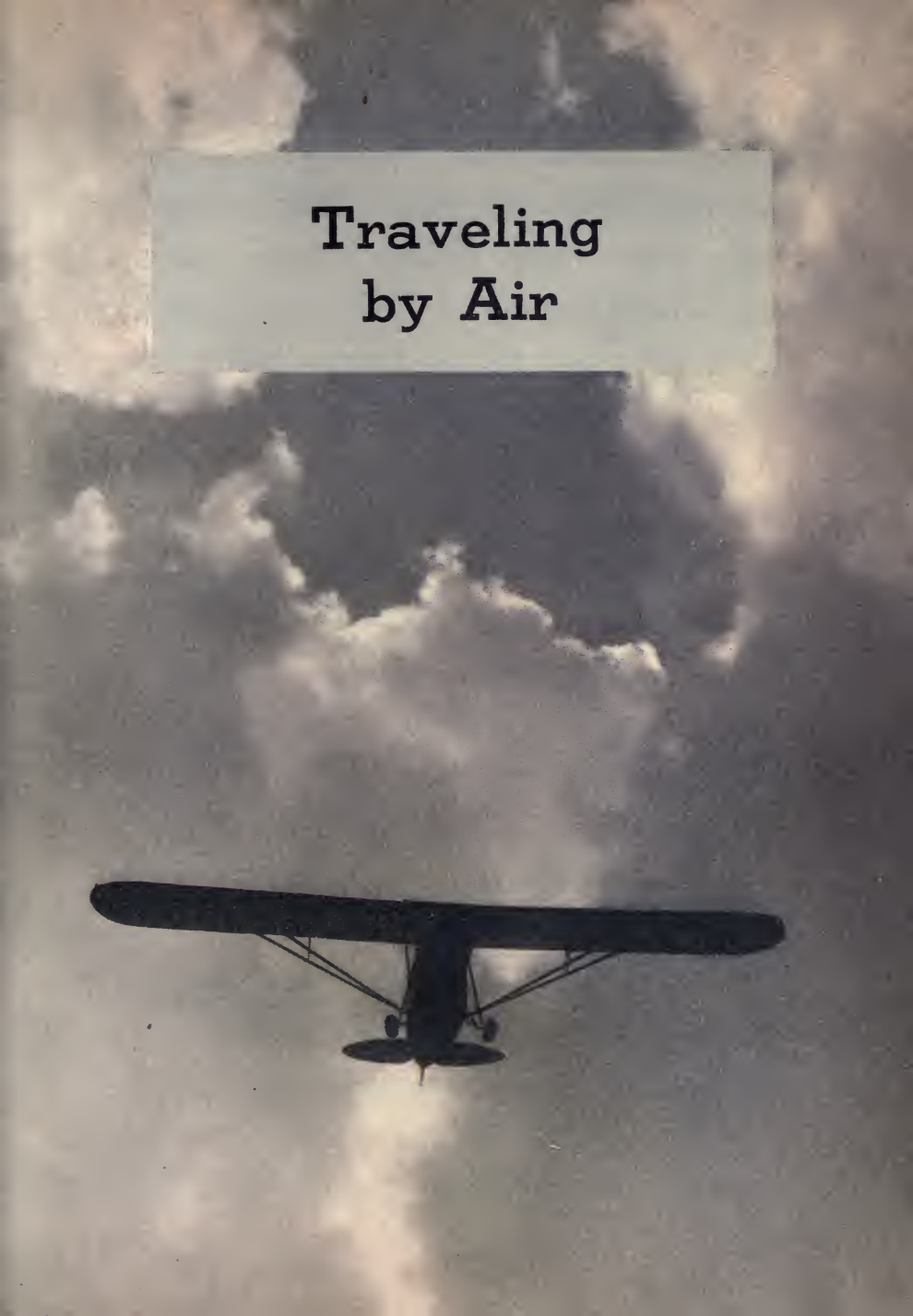
Ships have been changed very much since the time when men used rafts. Now one ocean liner can carry enough people to fill a town.

Today ships take loads and people to faraway countries. They bring us food, clothing, rubber, and other things we need for ourselves and our homes.

One man could sail a raft, but it takes many men to run a big ship. There are many different kinds of work to do. A ship has a captain, sailors, and men who cook and serve food. There are men who take care of the engines, and men who load and unload goods. Their work is not easy to do, and often it is not safe.

Good water transportation has helped to make the world seem smaller. It took Columbus ten weeks to make his first trip from Europe to America. Now we can make the same trip in five days.

Traveling by Air



The First Flying Machines

For thousands of years people have watched birds fly. They have said to themselves many times, "What a swift, easy way to travel!" But when people tried to fly, they fell to the ground.

It was many, many years before men learned the secret of flying. Wise men often wondered whether they could fasten wings to themselves and fly like the birds. They tried and tried. They fastened wings of many kinds to their arms and even to their legs. They tried other ways. But they could not fly.

When men first learned to travel in the air, they did not use wings. The first thing they learned was how to go up into the air and not fall to the ground.

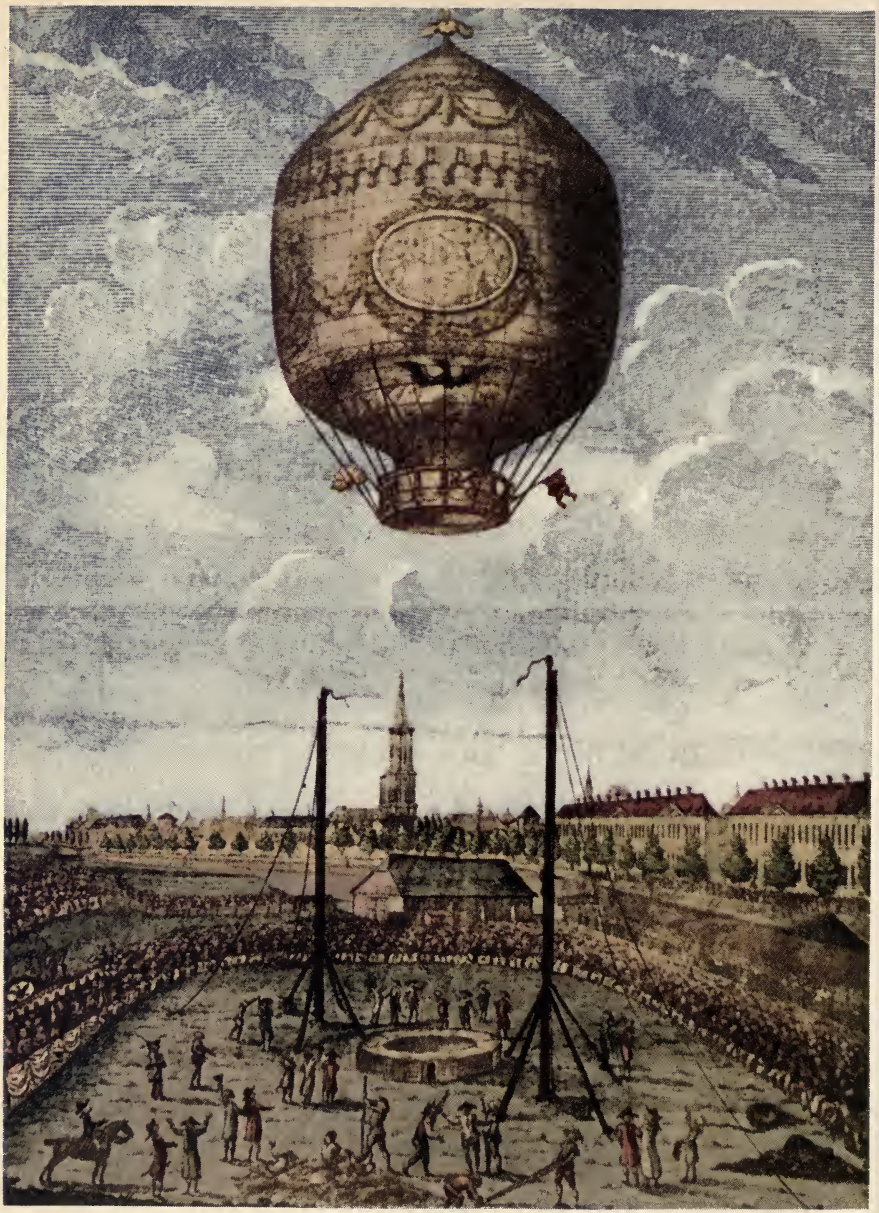
About 150 years ago two men who lived in France found a way to rise into the air. They were brothers, and their last name was Montgolfier.

These two men filled a large cloth bag with warm air. Warm air is lighter than cool air, and it will rise from the ground. When the bag was full of warm air it floated away from the earth. This bag was the first balloon.

The balloon would rise from the ground and float wherever the wind blew it. There was no way to steer it and make it go where people wanted it to go. There was no motor to make it go against the wind. When the warm air cooled, the balloon would fall to the ground. For this reason, the balloon could not stay in the air very long at one time.

Balloons were large bags made of cloth. Sometimes the cloth was covered with rubber so that the air could not get out.

When people first made balloons they did not ride in them. They sent the balloons up alone. People wanted to fly, but they did not know if it was safe.



But one day some passengers did go up in a balloon. Some men hung a cage below the balloon. They put a sheep, a rooster, and a duck into the cage. The ride in the air lasted eight minutes, and the animals landed safely.

At last men were not afraid to go up in a balloon. A man in France was the first to ride in the air. He rode in a basket hung from a balloon.

Men wondered how they could make longer flights. Soon they learned to take small fires up with them. In this way they kept warm air going into the balloons. Then the balloons would stay up in the air.

People had found a way to go into the air at last. They liked to fly, but they wanted some way to steer their balloons. Too many times they came down on buildings or in rivers. Men needed a way to steer balloons, and they needed motors to push the balloons through the air.

About one hundred years after the Montgolfier brothers made their balloon, a new kind of balloon was made. It was called an airship or a dirigible. Dirigible means "steerable." Dirigibles could be steered. They had motors to push them, too.

To steer airships, men used rudders and elevators. A rudder is an up-and-down "wing" or fin fastened to the end of the airship. The rudder makes a dirigible turn right or left just as the rudder on a steamship makes the ship turn right or left.

Elevators are fins at the back of the airship. They are raised or lowered to make the airship go up or down. Nearly all our air machines have rudders and elevators now.

To push the dirigibles, men first used steam engines or electric motors. These motors turned propellers. But steam engines and electric motors did not work well. They were not used long.

About this time, the first automobiles were being built. Gasoline engines made them go. And so men tried gasoline engines in airships. They were better than steam engines or electric motors.

Gasoline engines are made of light metal. The gasoline it takes to keep them running weighs less than the wood or coal needed for steam engines.

Long before this time, men had stopped using warm air in their airships. They used a gas called hydrogen. Hydrogen is many times lighter than air and does not have to be kept warm. It lifts airships better than warm air. But it burns easily. Many airships have fallen to the ground because the hydrogen has caught fire.

Helium is another light gas which is now used in dirigibles. Helium does not burn, but it costs a great deal of money. Most of it is found in the United States, and it can be bought only from the Government.

Zeppelins

One of the inventors who first used hydrogen for airships was Count Zeppelin, a German. He made dirigibles with a framework of light metal and a covering of cloth. Inside this outer shell were silk bags filled with hydrogen gas. Dirigibles of this kind are still called zeppelins because they were first made by Count Zeppelin.

Gasoline engines with propellers are fastened to the sides of a zeppelin. Cabins for the pilots and the passengers are built on the under part of the ship.

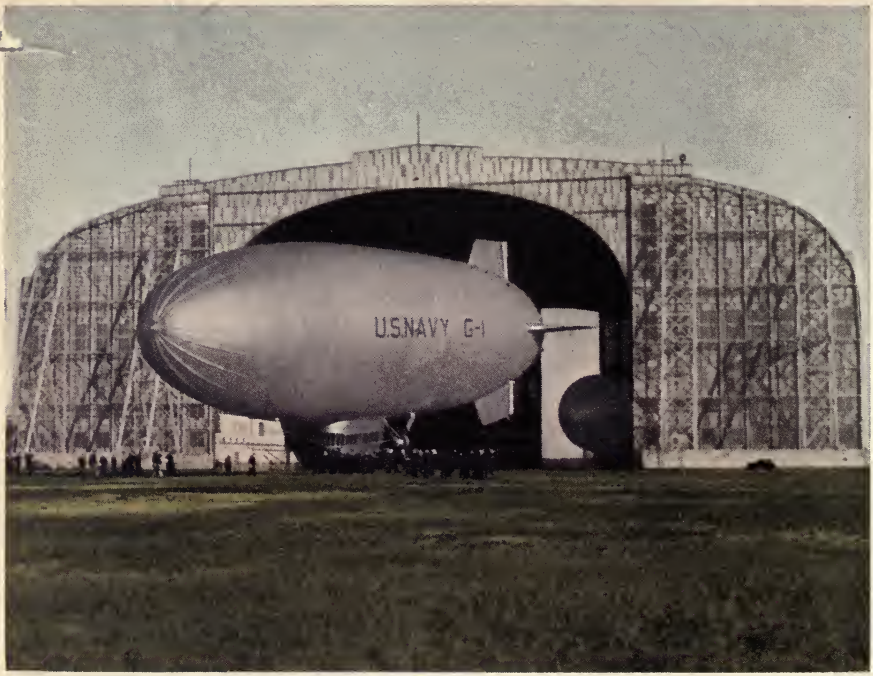
One of these ships is called the Graf Zeppelin. It is 770 feet long and can carry sixty passengers. In 1929 it flew around the world. It made this trip in twenty-one days.

Later the Hindenburg was built. It was nearly twice as large as the Graf Zeppelin. Both of these airships made many trips across the Atlantic Ocean.

Macon / blimps

Some dirigibles have been built for the United States Government. The picture shows an American dirigible, the Macon, flying over New York City.

There is still much to be learned about dirigibles. Many of them have crashed to the ground. The Macon fell in 1935. In 1937 even the great Hindenburg burned and fell to the ground.



Balloons without frames are still built. Some of them are called blimps. The blimp in the picture is owned by the United States Navy. It is being brought out of its hangar.

Hangars are large, long buildings in which airships and airplanes are kept. Airports in big cities have hangars. Hangars are really garages for airplanes.

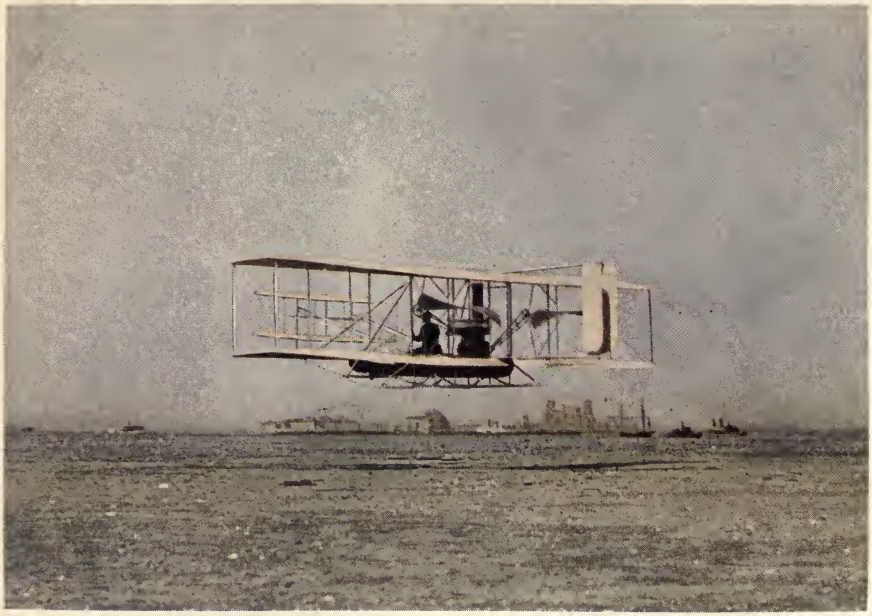
Airplanes

Both balloons and dirigibles are called lighter-than-air machines. They rise into the air because they are filled with light warm air or a light gas.

When airplanes were invented, they were called heavier-than-air machines. They do not float as balloons do. They can stay in the air because their motion makes air currents hold them up. An airplane cannot stay in the air unless it is moving.

The airplane was invented because men have never stopped trying to find better and faster ways to fly.

After men saw that they could not fly with wings that moved, they tried gliders. These gliders were little planes with very large wings. They did not have motors. A man could lie on a glider and float in the air. Samuel P. Langley, an American, made a large glider with a steam engine to push it. It was smashed on its first take-off.



Two brothers, Wilbur and Orville Wright, built many gliders. They learned to glide short distances. Then they put a gasoline engine into a glider. The engine turned two propellers.

At first this heavier-than-air machine would not leave the ground. They worked on it and changed it again and again. At last they had an airplane that would fly. It made its first flight in 1903.

On this plane the propellers were behind the pilot. Most planes have propellers at the front of the plane now.

There was no cabin on the first plane. There was only a seat in the open air. But now most planes have cabins where the pilot and the passengers sit comfortably.

Not all planes have the same number of wings. The Wright brothers' first plane had two wings. It was a biplane. Planes with three wings are called triplanes. Planes with only one wing are called monoplanes.

Most airplanes have wheels under them. These are landplanes. Planes which alight on the water are called seaplanes.

The body of a plane is called a fuselage. The fuselage of a seaplane is made like a boat. Some seaplanes have small boats fastened to the wings. These are called floats, and they are used to keep the plane balanced on the water.

Some airplanes are made so that they can take off from either land or water. They are called amphibians.

When the Wright brothers first kept an airplane in the air for a minute, everyone thought they had done a wonderful thing. Since that time, men have made airplanes which can fly for many hours. They go through all kinds of weather and fly at very fast speeds. They carry heavy loads and many people. The passengers are as comfortable as they would be if they were riding on a train.

Just as soon as good airplanes were invented, people began to use them in many ways. In 1918 the mail was first carried in airplanes. Now many letters and small packages are sent by air mail to all parts of our country and to many other countries. But airplanes are used most of all by people who wish to travel long distances very quickly.

Heroes of the Air

Many men have worked to give us new kinds of air transportation. People have risked their lives in making dangerous air journeys so that other people could make the same trips safely. These men are the heroes of the air.

People have tried to see how far they could fly. Six years after the Wright brothers made their first airplane flight, Louis Bleriot, a Frenchman, flew across the English Channel. It was a distance of twenty-five miles.

In 1924 three United States Army planes made the first air trip around the world.

In 1927 Charles A. Lindberg flew his airplane, The Spirit of St. Louis, across the ocean from America to France without stopping. He made the flight alone.

Rear Admiral Richard E. Byrd flew to the North Pole in 1926, and three years later he flew to the South Pole.

Women flyers, too, have done brave things. In 1932 Amelia Earhart flew across the Atlantic Ocean. She was the first woman to fly across an ocean. She was also the first woman to fly across America without stopping.

Five years later Amelia Earhart started to fly around the world. Everyone thought that would be her greatest flight. But on the last part of that trip she was lost. People think her plane must have fallen into the ocean.

In 1933 Wiley Post flew around the northern part of the world in seven days and eighteen hours. He made the trip alone at a speed of 127 miles an hour.

In 1938 another man made the trip in half this time. Howard Hughes, with a crew of four men, flew around the world in three days and nineteen hours. In his powerful plane, he made a speed of 208 miles an hour.

Regular Passenger Flying

Today people use transport planes to travel long distances quickly. A transport plane carries about twenty passengers. These planes can fly very fast. It takes them only fifteen hours to fly across the United States.

On a transport plane everything is done to make the trip a pleasant one for the passengers. They sit in comfortable seats and look out at the country below. Good food is served. Some planes have berths where the passengers may sleep at night.

People can cross the oceans in planes, too. Seaplanes called China Clippers make regular trips from America to China every week. They start from San Francisco and fly across the Pacific Ocean, stopping for gasoline at islands on the way.

These great flying boats carry twenty-six passengers and a crew of seven men. They carry mail and small packages, too.

Big planes called Brazilian Clippers fly from the United States to South America.

In 1939 regular passenger service by airplane across the Atlantic Ocean was started. These giant planes leave New York City and arrive in France or England two days later.

Many careful workers are needed to take passenger planes from place to place safely. Most transport planes have three people for a crew. The China Clippers have seven.

Every transport plane has two pilots who take turns at driving the plane. Pilots must study about flying for several years. They must fly thousands of miles before they are allowed to fly passenger ships.

In every big transport plane there is a young woman called the stewardess who helps to keep the passengers comfortable. She takes care of them if they are not well. Every stewardess is a trained nurse.

Mechanics look over a transport plane each time it lands. After every trip the mechanics clean the engines. Everything is done to make sure that the engines will keep running while the plane is in the air.

These men are airport workers. Other airport workers are the ticket agents, the men who load mail and baggage, and the men who take care of the field and lights.

Airports are owned by cities. They are the railroad stations of the air.

Safety in the Air Today

Besides the well-trained pilots, men on the ground help the transport planes to make safe trips.

Dispatchers are men who direct traffic at the airports. By using radios they tell pilots when to land and when to take off.

Perhaps the men who do most to keep flyers and their planes safe are the radio operators. They know where the planes are and where they are going. At each large flying field there is a man who studies the weather. The radio operator broadcasts the weather reports to the pilots.

When a pilot knows what kind of weather to expect at the different places, he can tell how high to fly and what parts of the country to keep away from. If the weather is not good for flying, the pilot does not take the ship into the air.

Radio reports are only one of the things done to make air travel safe.

Pilots have many instruments to help them fly safely. There is one instrument which can fly a plane through the air without the help of the pilot.

All across the United States there are "airways" or air roads where planes fly. These airways are marked at night by beacon lights. Along each airway there are many fields where the planes may land if they are in trouble.

Radio beams help pilots fly along their airways even on foggy or snowy nights. Radio beams keep them from getting lost when they cannot see the beacon lights.

As long as the pilot is on his airway, he hears a high humming sound through the earphones of his radio. It is the sound from the radio beam.

If he should get off his airway, the sound from the radio would be different. Instead of the regular hum, the pilot would hear first a long sound and then a short sound. These sounds are called dashes and dots. They would tell him that he was not in the airway. They would tell him which way to go to get back to the airway.

On the water, men have lifeboats and life preservers to use if their ships sink. In the air, men use parachutes to get to the ground safely if a plane begins to fall. A parachute is like a big umbrella. It catches the air and falls to the ground slowly.

Flying Faster than Birds

Men have known how to fly for only a few years. But in that time they have made air trips all over the world.

Planes have flown over high mountains, over wide, hot deserts, and over dangerous jungles.

Automobiles cannot travel in these places because there are no good roads. Roads cannot be built there very well. Railroad tracks cannot be laid there easily. But airplanes can be used in these places. They do not need roads or tracks.

At last men have learned to do something they have always wanted to do. They have learned to fly. With their airplanes men can fly faster and for a longer time than any bird.

For many years men and their loads have been transported on land and on sea. At last they are being transported through the air.

Speaking and Writing

Talking and Writing

People now have many ways to let each other know what they are thinking. They talk. They use the telephone. They write letters. They send messages by telegraph. They print what they think in newspapers, in books, and in magazines. When people do any of these things, we say they are communicating.

Long, long ago, people did not know how to communicate in these ways. They did not talk to each other in words as we do now.

Men had to learn ways to communicate, just as they had to learn ways to transport things. They invented signs and words so that they could talk to each other.

People communicate more often by talking than in any other way. We call this conversation. The only people with whom we can communicate when we talk are the ones who can hear our voices.

Once no one knew how to write. But men wanted to make records of things they had done so they would not forget them. They needed to keep records of things they bought and sold. When they went on journeys, they wanted to send messages back home. And so writing began.

The early writing did not look like our writing today. People began to write by making pictures and marks.

When we speak or write, we make words. When people look at words and know what they mean, they are reading. By writing or printing our messages we can communicate with anyone who can read.

This part of the book tells the story of how people learned to let each other know what they were thinking. It tells how men put words into writing so that they can be read by others.

Later we shall read how people send written and spoken messages.

How Men Learned to Talk

It took men a long time to learn how to talk. Words were not easy to invent. But people always had things to say to each other. And so they never stopped trying to find ways in which to say them.

We know that animals have ways of talking to us. Sometimes we think that they talk to each other, too. But they cannot speak any words. If a dog is angry, he gives a sharp, loud bark. When he is happy, he barks in a different way. When he is hurt, he whines.

We can tell what a dog means or how he feels by the way he barks. In the same way, people talked to one another at first by making sounds in different ways to mean different things.

Words grew up because men named things after sounds that they heard. The early men heard many noises in the woods and around their homes.

The words for different animals came from the sounds the animals made. The word for dog would be "bow-wow." The word for donkey would be "hee-haw."

Some words grew out of the sounds people made when they did different kinds of work. The word for lifting was "heave." The word for pulling was "haul."

Such words as "whisper," "roar," and "crack" came from sounds, too. An Indian tribe in South America has a good word for "sneeze." It is "haitschu."

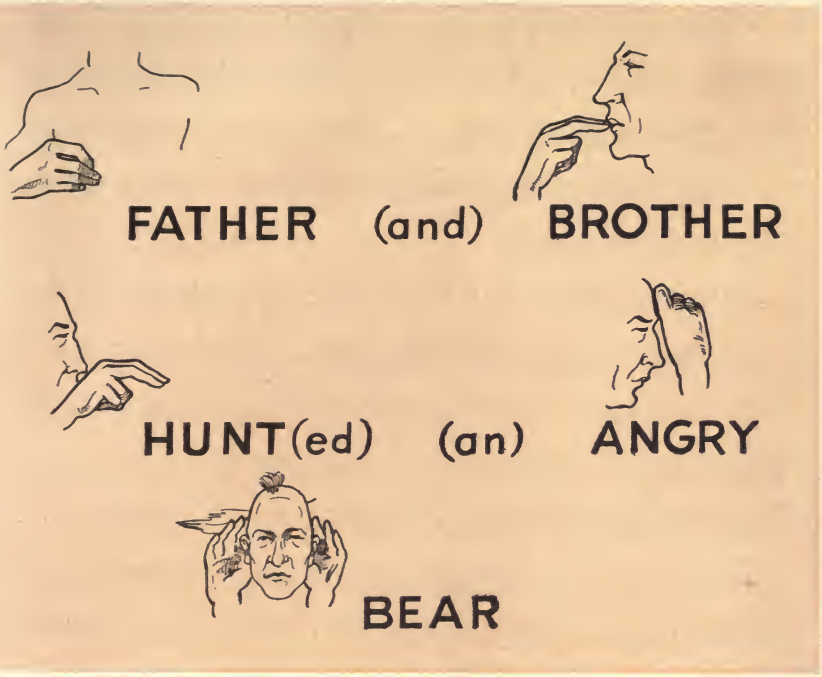
But most words are not made from sounds. They have just grown up, no one knows how. As people used them, they became part of the language.

When a man used one certain sound to mean the same thing each time, he had made a word. Soon his whole family used the word and knew what it meant. Then each family in the tribe began to use it. A language grew up in that way.

Talking by Signs

The men of long ago talked to each other by making motions with their hands, too. This way of communicating is called sign language.

The American Indians had a good sign language which could be understood easily. At first that was the only way they could talk to the white men.



Different Indian tribes had different word languages. But all the tribes could communicate with each other some by using signs.

The picture shows how an Indian might tell about a hunting trip. Although Indians could tell about many things in sign language, there were many other things which they could not say.

Sometimes we see people moving their arms and hands as they talk. Such motions are called gestures. Often people can say things better by using gestures along with their words.

Some people cannot hear or speak. We say that these people are deaf and mute. But they can communicate by using a sign language. They spell out words on their fingers, making a sign for each letter.

We use sign languages to send messages short distances. Railroad men use signs to communicate from one part of a long train to another. A brakeman waves his hands up and down at his sides to tell the engineer to stop the train. He raises one hand to tell the engineer to go ahead.

In a baseball game the umpire moves his arms to show if the runner is safe at the base or out. And some of us wave to one another when we are too far apart to be heard.

Languages and Dialects

Languages keep changing. New words are added. Old words change in meaning. There are about a thousand different languages in the world. They have grown up in many ways.

New words, such as "daytime," are made by putting two words together. Some words come into a language from other languages. For example, "garage" and "crayon" came into the English language from the French.

Sometimes we invent new words when we need a name for a new thing, such as an airplane or an automobile. If there is a real need for a new word, one is made.

Some of the people who use the same language pronounce words in different ways. We say that they have dialects. In the United States people in the South speak differently from those in the West or East. While the dialects are different, the people all speak the English language.

The Beginning of Writing

It is hard for us to believe that once people could neither read nor write. But it is really true.

It took men a long, long time to learn to write. Many years passed while they were learning.

Before there was writing, people used many queer ways to remember things. They tied knots in strings, and each knot stood for something they wanted to remember. They also made notches in wood. This was not real writing, for no one but the man who made the knots or notches knew what they meant. And sometimes even he forgot.

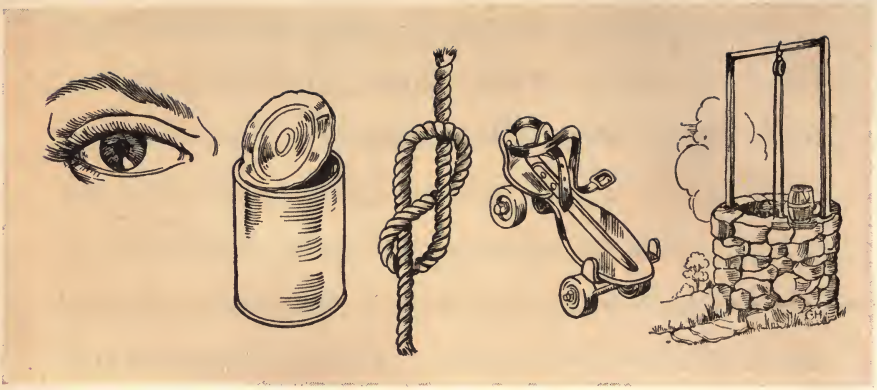
People needed a better way to keep their records. They began to draw pictures to help them to remember things. We call this picture writing. It was the first kind of writing. It was not at all like the writing we have today.

But picture writing was real writing. Other people could look at the pictures and know what they meant.

When a large animal had been killed on a hunt, the early men drew a picture of it. Many pictures of animals have been found on the walls of caves. These pictures tell stories. They were made long ago by people called cave dwellers.

Men did not like picture writing because they could not say enough. Many things that they wanted to say could not be told in pictures. They did not know how to write words like "night" or "morning."

There was no way to draw a picture of the night or the morning. And so men made pictures that stood for these things. They drew a star and a moon to mean "night." To write "morning" they made a picture of a rising sun. This was a new kind of writing. Men were at last making pictures of ideas.



Then people began to make pictures that stood for sounds. If they wanted to write "I see well," they could draw an eye, a sea, and a well.

We sometimes play a game called "rebus" in which we tell a message that way. The pictures on this page make a rebus. One picture stands for the word "I," and another picture stands for "well." Can you tell what sounds the other pictures stand for and then read the sentence?

This kind of writing saved time. Men could not make mistakes so easily, for they were making marks to mean sounds.

As men wrote by making their pictures stand for sounds, they wrote fast and left out parts. They made marks which did not look like pictures at all.

Then they learned to use just one kind of mark for each different sound. These marks were letters. All the different letters together made an alphabet.

Our alphabet has twenty-six letters. Each letter has a name and stands for one or more sounds. By putting letters together in different ways, we can write any word. Other people can read our words because they know what sounds the letters stand for.

The Chinese people do not have an alphabet. They make a different mark for every word. Chinese boys and girls have to remember thousands of different marks. In our language we have only twenty-six letters to remember. With them we can write all the words we need to use.

Men Learn to Use Numbers

There was a time when men did not use numbers. People did not live near each other then. Each family found its own food and made its own clothes. There was no buying and no selling. And so there was not much need for counting.

When transportation and communication became better, men saw each other more. Often one man had something he was willing to give for things another man had. The two men would make a trade.

Sometimes a man wanted to trade his deer for rabbits. One deer had more meat on it than several rabbits. The man who wanted to trade the deer had to tell how many rabbits he would take for it. People did not have money in those days. They needed numbers for these things.

At first, counting was done by making marks on a stick or in the ground. Each mark stood for "one."

Men used only a few numbers at first. Some counted to five because there are five fingers on a hand. Others counted to ten, using the fingers on both hands. Still other people counted to twenty, because there are twenty fingers and toes.

After men learned to write, they began to make marks to mean different numbers. They gave names to the numbers and they learned to count.

Men who did the first trading used numbers more than the people who lived far off by themselves. The numbers we use today were used first in India. They are called Arabic numerals.

People do more trading today than people ever have done before. They buy and sell more. But they do not trade animals for food or other goods, as men did long ago. They use money now. We work for money, and we trade the money for the things we want.

Writing Materials

Before men could write, they had to keep in their minds everything they wanted to remember. Stories could not be written. They were told by fathers and mothers to their children. When the children grew up, they told the stories to their children.

When men learned to use the alphabet, they could write stories for all people to read.

One thing still made writing hard. The people of long ago had no paper to write on. We cannot see how anyone could get along without paper. We use it for most of our writing today. We print our newspapers, magazines, and books on it.

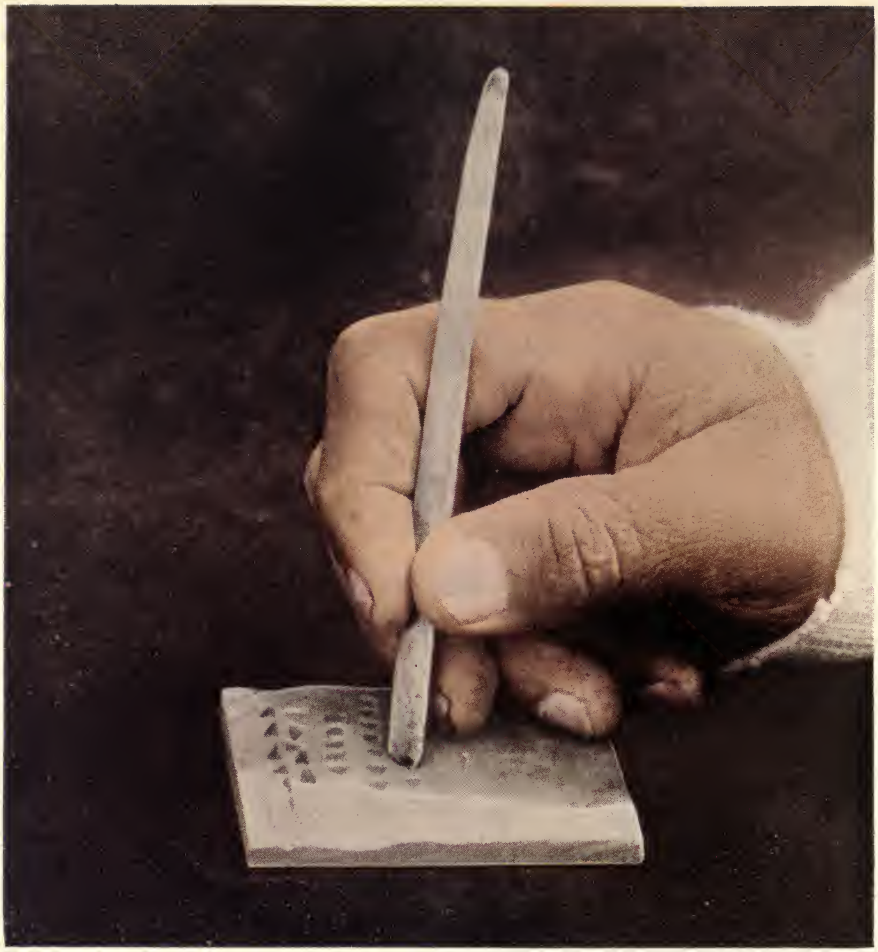
The people of long ago wrote their messages on the walls of caves and in the dust on the ground. These were not very good ways. People needed to write their messages on something that could be carried from place to place.

Indians painted their picture messages on bark and on pieces of animal skin. They carved and painted messages on tall poles, too. These were called totem poles.

The Egyptians carved stories on pillars and on the stone walls of buildings. People have learned to read the messages that were cut into stone so many years ago.

The Egyptians made something very much like paper for some of their writing. It was called papyrus because it was made from a plant called papyrus. The inside bark from the stem of this plant was cut into thin pieces. The pieces were pasted together into long strips.

The Egyptians wrote their messages on papyrus with ink and a reed pen. Then the strips were rolled up as we roll up paper. The rolls were called scrolls. Scrolls were the only books the Egyptians had. A message written on papyrus is shown on page 153.



The Babylonian people lived near the Egyptians. They had a different way of writing. They wrote their messages on flat pieces or tablets of damp clay.

They made three-sided marks in the soft clay with a stick. This was cuneiform writing. After the pieces of clay had dried, the message could be sent far away and read by many people.

One of the first libraries in the world was in a city in Asia called Nineveh. In this library there were ten thousand clay tablets covered with cuneiform writing.

The Romans wrote on flat boards covered with a thin coat of wax. They used pointed sticks to make letters in the wax. Roman letters looked very much like the capital letters we use today.

When a Roman writer wished to erase what he had written, he smoothed the wax with the side of his stick. Then he was ready to write something else.

Besides writing on papyrus, men wrote a great deal on parchment. Parchment is smooth white animal skin from which the hair has been removed.

Parchment was sometimes used to make scrolls. The first real books had leaves of parchment and thick covers of wood.

In the early times, everything was written by hand. If another copy of a book was wanted, it had to be written all over again. This was slow work and was done by writers called scribes. Many scribes were monks. Monks were men who spent their lives doing good.

But most of the people in the world then did not care about books. Not many people could read or write. There were only a few books. The monks took care of them. When a book wore out, the monks made a new one.

Many mistakes were made as the books were copied time after time. Each scribe would make some mistakes such as leaving out words or changing words. Today we have printing presses that make thousands of copies of a book all alike.

The monks made their books as beautiful as they could. Sometimes they spent years working on one book. Often they drew pretty pictures beside the letters. They used many colors and even gold and silver.

Here is part of a page of a book nearly one thousand years old. Inside the large letter "C" is a picture of a monk writing.

The Coming of Printing

Just think how different everything would be today if our books had to be copied by hand as they were many years ago! We would not have many books, and they would cost so much that only a few people could own them.

About five hundred years ago men invented a way to print. Before this, the Chinese had known how to carve on little blocks the signs they used for words. The Chinese printed by putting ink on these blocks and then pressing them down on paper.

The monks had learned to carve letters, too. They printed big capital letters at the beginnings of pages.

But real printing began when someone thought of making a little block for each letter. At first these blocks were made of wood. Later they were made of metal. We call them type.

One of the first books printed from the new type was the Bible. It was printed by a man named Johannes Gutenberg, a German.

Gutenberg's printing press was very different from the fast-moving machines we have today. In the early days of printing, men picked out the pieces of type by hand and arranged them into lines. Then the lines were made into pages. Lines of type were bound together tightly and put in the printing press.

Ink was spread on the type. Each piece of paper to be printed was dampened and laid against the inked type. The upper part of the press was screwed down tightly against the paper. Then it was unscrewed. The page was taken out and laid aside to dry.

How slow this was! But it was much faster than the old way of writing every page of a book by hand.

Paper

The books of long ago cost a great deal of money. One reason for this is that they were copied by hand. Another thing that made books cost so much was that they were made of papyrus or parchment. It took a long time to make the papyrus and parchment.

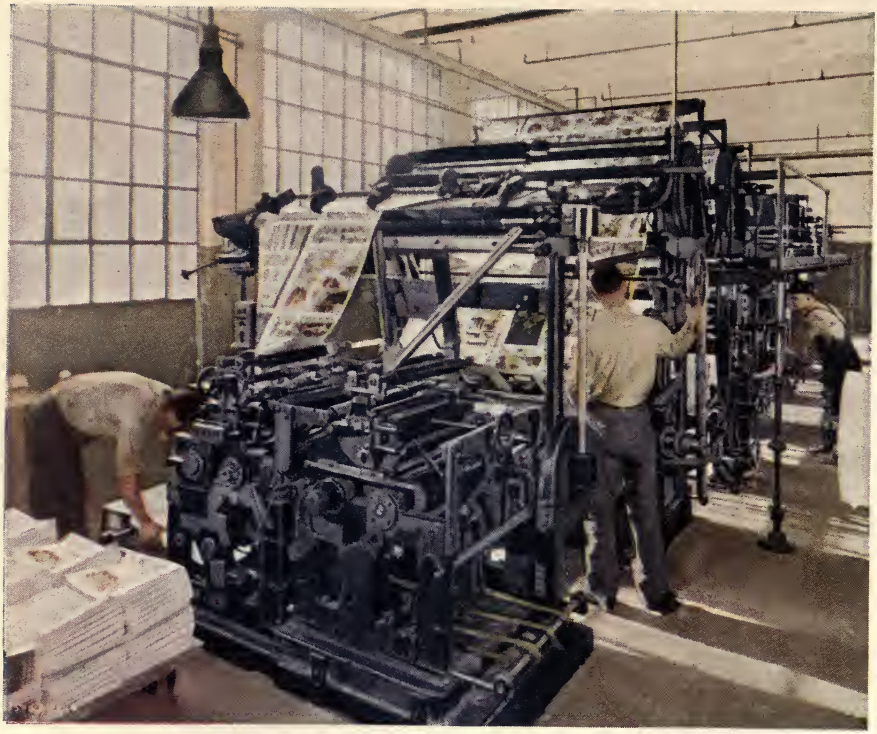
The use of paper and the invention of the printing press changed all this. Now we can buy magazines, thick newspapers, and good books for only a little money. Almost anyone today can own books.

The Chinese people were the first to make paper. Then people in Spain learned to make it, nearly a thousand years ago. Before the time of Gutenberg, paper was being made in most European countries.

Many thousands of tons of paper are now made in large paper mills every day. Much of the paper is made from ground wood. Some of it is made from rags.

Logs or rags are cut into tiny bits and cooked and washed. The tiny bits and the water together make what is called pulp.

The pulp flows out onto a moving wire screen. As the pulp moves along, the water runs through the screen. A soft material like blotting paper is left. This is pressed between hot rollers and becomes paper.



Newspapers and Books

We have many uses for paper. Much of the paper that is made today is used for newspapers, magazines, and books.

Almost every city has one or more newspapers. They bring news of what is happening in the world. Millions of books and magazines are printed every year.

Each morning millions of people buy newspapers. In the evening many more papers are bought. On Sunday nearly twice as many papers are sold as on the other mornings of the week.

In a big newspaper plant the printing presses are sometimes forty feet long and twenty feet high. The paper is on heavy rolls ten or twelve feet wide. It is drawn through the presses swiftly. A large press can print twelve hundred newspapers of forty pages every minute.

When the newspapers come out at the other end of the press they are printed in black and sometimes in colors. They are already folded and ready to be sold. Then the papers are tied in bundles and are taken by trucks to the newsstands in different parts of the city, and to trains.

Many people have newspapers delivered to their homes every day. Other people buy them from newsboys.

Since Gutenberg first printed books on his little press, there have been many inventions to make printing easier. One of them is the Linotype machine.

Before a newspaper, magazine, or book can be printed, all the words have to be set up in type. The Linotype machine makes it easy to set type quickly.

Some printers still pick out type by hand and make it into words and lines. This is slow work. But with a Linotype a man can set a line of type as easily as one can type the same words on a typewriter. Each line of type is one piece of metal. These are put together and are used to print newspapers, magazines, or books.

We should not like to think of a world without paper or printing. When the printing press was invented, not many people could read. There were few books to read.

But today we have many books because they are printed by machinery. Most people can read and they like to read. Many of the things men have learned since long ago may now be read in books.

How Communication Helps Us

If people live all by themselves, as the first people did, and never talk to anyone or read anything, they are not so happy as they might be. They do not have many things to think about.

It is good for people to communicate. In talking with friends, we learn new things. We learn what others think. We learn of interesting things others have done. Sometimes we learn about faraway places of the world.

Written communication is important, too. We need to read and study many books. We learn many things from them. We learn things that help us. In magazines we find interesting stories. In newspapers we find out what is happening in our country and in other countries.

Both spoken and written communication helps us to know more and to live happier lives.

The Sending of Messages

Sending Messages Long Ago

As men learned more about the world, and as transportation got better, people began to travel more. Sometimes they took their families to new parts of the world to live.

But they could not forget the friends they had left behind. They wanted to send messages to these people. They could talk and they could write, but how could they send their messages so many miles?

At first, men had to send someone back to the land from which they had come if they wanted to send a message there. Sometimes messages were sent with travelers. The trips were often long and hard.

More people came to live in each country. Rich men owned more land. Countries grew larger and larger. Kings and rich men needed a good way to send messages quickly. They paid other men to carry their messages for them.

These messengers were fast runners. They raced along with the king's message and delivered it just as quickly as they could. They hardly stopped to rest or sleep. The king's message was important. They kept it safe and lost no time on the way.

When a message was to be sent a very long distance, several messengers rode on horses. A messenger rode as fast as he could go for a few miles. At a certain place a new horse was ready for him. The rider would leave his tired horse there and ride away on the horse that was not tired.

After this rider had gone many miles and ridden several horses, he would be tired, too. At another place, he would give the message to a second rider who was waiting. This messenger would ride swiftly on his way. Then a third rider would take the message. In this way the message was kept moving all the time.

The great countries of long ago built good roads for their messengers. We have already learned of the fine Roman roads.

When Rome was no longer an important country, the roads were not kept up well. Then it was almost as hard to send a message as in the time of the first men.

At last mail service was started. Men called couriers were hired by companies to carry mail. The companies charged so very much to carry one letter that only a few people could send messages that way.

Then some countries in Europe started post offices like the ones we have today. Government men carried mail quickly and for very little money.

In the United States there were no good ways to send mail at first. Letters were carried by travelers. Ship captains carried letters across the ocean free.

Then better mail service was begun. Nearly two hundred years ago Benjamin Franklin became head of the post offices. At that time the mail was carried by men on horseback. What exciting adventures these mail carriers had, riding through the dark forests and meeting Indians! They traveled through deep snow and on rough corduroy roads.

Carrying Mail in the West

Later, mail was carried by trains in the eastern part of the United States. But people needed a way to send mail from the Mississippi River to the Pacific coast.

So the Pony Express riders began to carry mail to the West. It was a long, dangerous trip. They were good riders and they made the trip in eight days.

Strange Message Carriers

Today most mail is carried very quickly by trains or airplanes or ships. But in some places it is still carried in strange ways.

In Alaska, when the ground is covered with ice and snow the mail is carried by dog sleds.

In Holland, where there are many canals, the postmen travel on skates in the winter and by boat in the summer.

There are islands in the ocean and small towns in some parts of the world which get mail only by boat. The boats do not come often.

Sometimes messages are brought by carrier pigeons. These birds are taken away from home. A man may write a message on a little piece of paper and fasten it to a pigeon's leg. The pigeon will fly home with the message. Sometimes a carrier pigeon flies fifty miles in an hour.

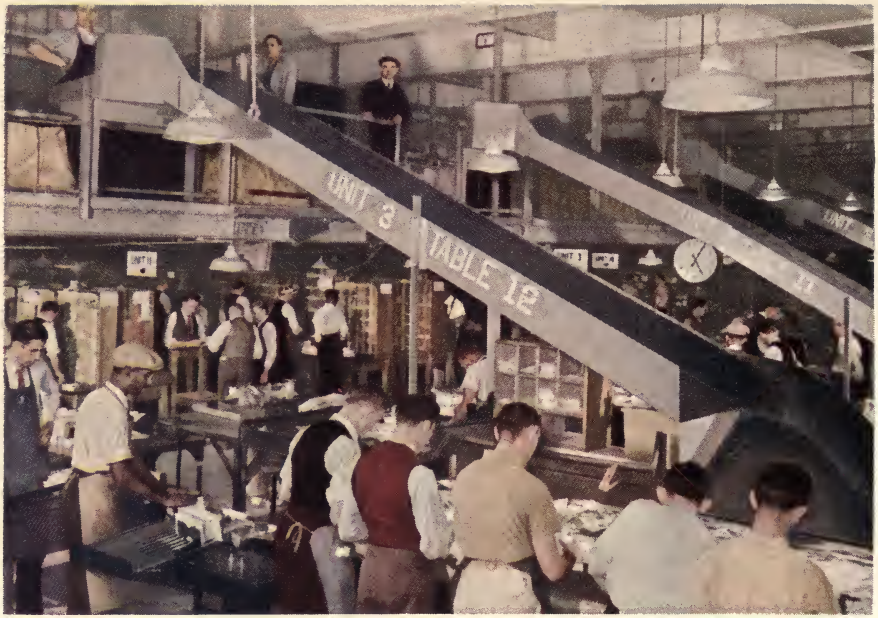
Mail Service Today

We are used to the fine, fast mail service we have today. It makes us wonder how people got along for thousands of years without good, cheap ways to send messages.

A three-cent stamp will take a letter to any place in the United States. We may send a postal card for one cent. Even packages may be sent anywhere in our country for very little money.

We can send messages by mail to people living in faraway countries, too. A five-cent stamp will take a letter from the United States to any country in Europe.

Today anyone can send messages to his friends. At one time only rich people could afford to send messages. Now we just put a stamp on a letter and take it to the post office or to the corner mailbox. The mail service does the rest of the work for us. How wonderful it is to have good mail service!



A post office in a big city is a very busy place. It takes care of letters from many offices and homes. It gets hundreds of letters and packages ready to go out on the mail trains and planes.

Mail is brought from mailboxes to the post office by trucks. The mail is dumped into chutes. It slides down onto tables. There men look at the mail and sort it. They must do this quickly.

These men take out special-delivery and air-mail letters and packages. These are sent to other tables to be sorted again and are sent out before the other mail.

The regular mail is carried to the end of the table. There a machine stamps the name of the post office and the date on each letter. This machine works very fast. It is called a cancelling machine because it cancels the postage stamps by putting marks on them so that they cannot be used again.

Next the mail is sorted for different parts of the country. Letters going to the same town or state are put in the same mailbag. Trucks take the mailbags to the railroad stations or to the airports.

When the mailbags reach the towns, they are taken from the trains or airplanes and carried by trucks to the post offices. Then the mail is given to the mail carriers. They take it to the right addresses.

Mail addressed to people who live on farms is delivered in another way. A rural mail carrier takes the letters and packages to the farmers. The mail is put into boxes which are on posts near the road. We call this service Rural Free Delivery because the post office delivers the mail from the nearest town without any more cost.

Sometimes a message is so important that it must be delivered very quickly. Then we put a special-delivery stamp on the envelope. This stamp costs ten cents. A three-cent stamp must be on the envelope, too. As soon as the letter reaches the right town, a special mailman takes it at once to the person who is to receive it.

Many letters and small packages are carried by airplane. Air mail goes very much faster than mail sent by train. If an air-mail letter is mailed in New York City early in the morning, it can be delivered in Chicago on the same day.

It costs more to send a letter by air mail, but the letter travels faster. An air-mail stamp costs six cents.

We use the mail service more than any other way to send messages long distances. Many people spend all their time helping to take mail from one place to another. How different they are from the runners of long ago! But they are the messengers of today.

Railroads and Postal Service

Railroads carry most of the mail today. On many trains there is a special car for mail. This car is really a moving post office.

Mail clerks in railway mail cars sort the mail for the smaller towns just as mail is sorted in post offices. All the mail for one town is put in a bag which is marked for that town.

Mail trains do not stop at all small places. Mailbags are thrown off at some towns as the train goes rushing through. Mail is picked up, too, while the train is moving. A mailbag is hung near the track. A steel arm is pushed out from the mail car. It catches the mailbag and pulls it into the car while the train races along.

A letter can be mailed on a mail car. If we go to a station when a train is waiting, we can put a letter in the mail car. It will be marked "Railway Post Office" and delivered like any other letter.

Messages across Space

Sometimes messages must be sent more quickly than the fastest trains or planes can carry them. Men have always wanted to send messages that did not have to be carried by any person, animal, or vehicle.

Perhaps one day long ago, a man was walking through the woods. He happened to hit a hollow log with a stick. That made a loud noise.

The man took the log home. He had found a way to make a noise that could be heard far away. He told his wife and children to hit the log three times when they wanted him to come home quickly.

One day the man was hunting. He heard three sounds from the log. He hurried home as fast as he could go. One of his children had fallen from a tree and had been hurt.

This was one of the earliest ways of sending messages by sounds.

Different numbers and kinds of sounds would mean different things. In Africa, messages are still sent by beating drums.

When drums are used, the man who hears a message knows that it must be sent on. Then he beats a drum to tell the message. Someone else hears and beats another drum. In that way the message travels farther and farther.

Other sounds, such as bells, whistles, and horns are used to carry messages. Soldiers are called together by a bugle.

But signals that are seen work better than signals that are heard. Indians often sent messages with smoke and blankets.

An Indian would build a fire of green wood and leaves to make a lot of smoke. He would hold a blanket over the fire. Then he would pull the blanket back, and a ball of smoke would roll into the sky. Indians far away could see the smoke and understand the message.

On sunny days, Indians flashed messages with mirrors, too. A message can be sent for miles with a small mirror.

Lights have been used as signals for many years. Long ago, torches were used by the Greeks. They moved their torches up and down or waved them from side to side to spell out words.

Railroad men use lights for signals. Sailors watch for lights on lighthouses. Airplane pilots are shown the way at night by lights on the ground. Traffic lights tell us when to stop and when to go.

Flags are used for sending messages, too. Ships at sea communicate by flags. Boy scouts send flag messages. A boy scout holds his flags in a different position for each letter. By moving his arms, he spells out words. Another scout watches and answers. If the scouts are far apart, a boy with a field glass reads the message and tells what is being said.

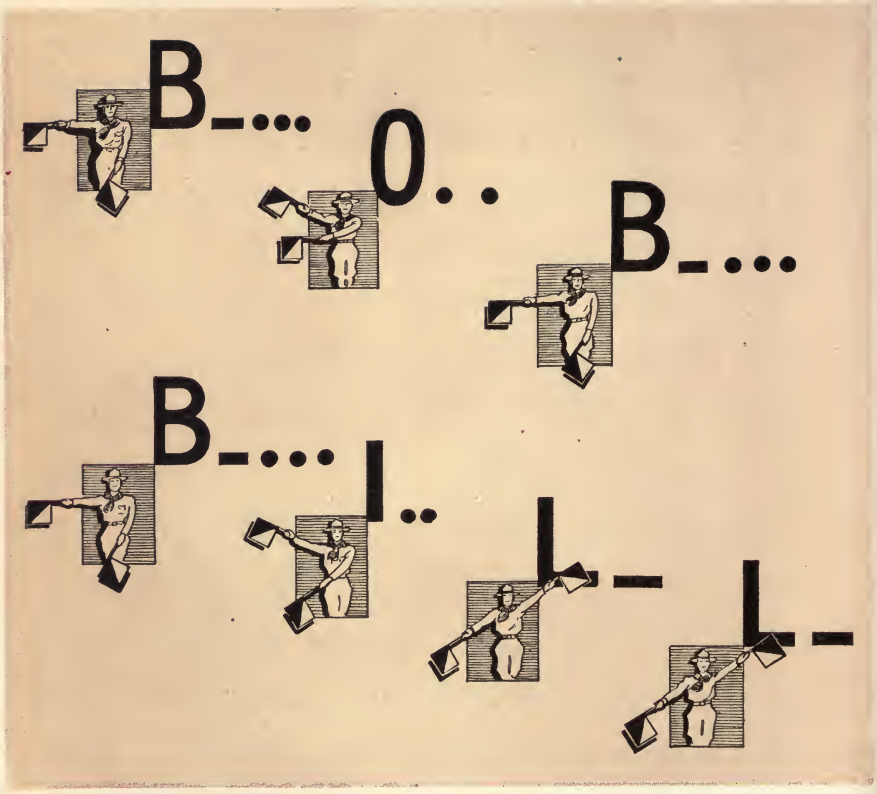
Codes and the Telegraph

When boy scouts send messages with flags, they must know what each position of the flags means. All of the positions put into a list make what is called a code.

To send a message, one must know the code. Anyone who gets the message must know the code, too, or he cannot tell what the message means.

Nearly one hundred years ago, an American named Samuel F. B. Morse found a way to send messages over a wire by electricity. He made what we call the telegraph. He worked out a code of dots and dashes for the letters and numbers.

If you listen to a telegraph instrument, you hear many clicking sounds. Some of the clicks are long and some are short. A short click is called a dot, and a long click is called a dash. A dot and then a dash is the code signal for the letter "a." A dash and three dots is the signal for "b."



Samuel Morse's code of dots and dashes is called the Morse code. Many boy scouts have learned this telegraph code as well as the flag code.

The picture shows how the names of Bob and Bill would be sent by flag code, and by telegraph code.

A message sent by telegraph is called a telegram. When we send a telegram we write the words on a telegraph blank. We give this to a man at the telegraph office.

He uses a little machine, called a sending instrument, to send the message over the wires. On this instrument there is a key. When the telegraph operator presses the key, electricity is sent through the wire. It makes a click on the receiving instrument in the telegraph office to which the message is being sent.

The telegraph operator makes a dot with a quick touch of the key. A longer touch makes a dash. He can send words in this way almost as fast as we could write them.

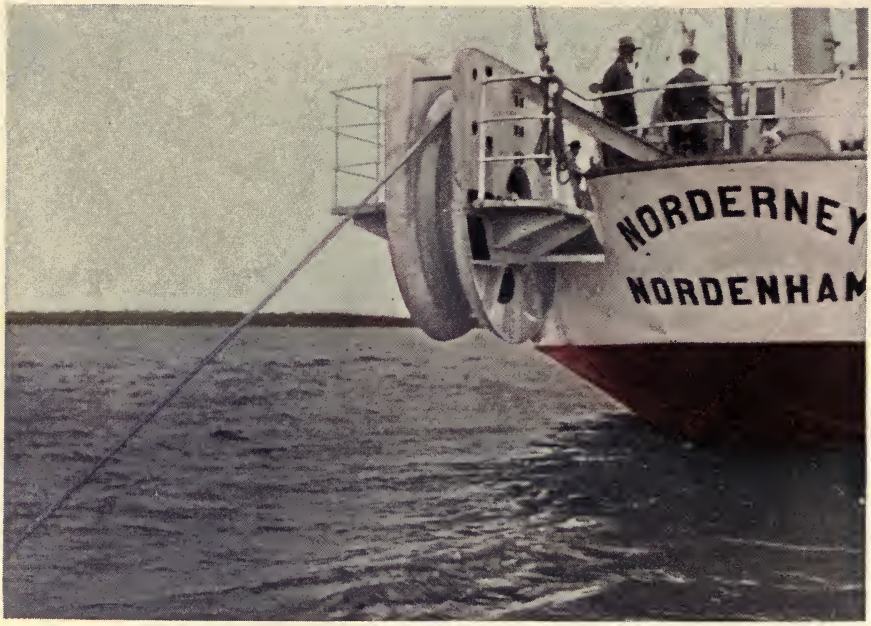
The operator at the receiving instrument must be able to tell what the dots and dashes stand for. He writes or types the words on a piece of paper so that the person to whom the message is sent can read it.

In large cities, most telegrams are sent on machines that look like typewriters.

The operator sends the message by touching keys. When the "a" key on the sending instrument is pushed down, electricity goes through the wire. It pulls down the letter "a" key on the receiving instrument. This prints "a" on a moving paper tape. Other letters are printed in the same way.

The tape is pasted on a sheet of paper. This is a telegram. A messenger boy then delivers the telegram. He is another person who helps us to communicate today.

Telegrams may be sent to almost any town in the United States. Messages can be sent very fast by telegraph. As fast as a word is typed on the sending instrument, it is printed by the receiving instrument far away.



Telegraph messages are also sent to countries far across the oceans. These messages are called cablegrams. They go through cables laid on the bottom of the ocean.

Cables are made of many wires which are put together and wrapped carefully so that they cannot be broken easily. Sometimes men have to pull up cables and repair them as the men in the picture are doing.

The Telephone

After the telegraph had been used for some time, Alexander Graham Bell found a way to talk over an electric wire. He made what was really a speaking telegraph. It was named the telephone.

If you hold your hands tightly over your mouth and say "oh," you can feel the air move. That shows that sound is a movement or vibration of the air.

When we speak into the telephone, the vibration of the air moves a thin piece of metal in the mouthpiece. This vibration is carried by electricity along a wire to the receiving telephone. There it makes a piece of metal in the telephone receiver vibrate in the same way.

This vibration in the telephone receiver moves the air and makes a sound. This sound is the same as the one spoken into the mouthpiece. That is how we can hear words over the telephone.

We can talk over the telephone to anyone else in the world who has a telephone.

First we look in the telephone book for the number of the person to whom we wish to speak. Then we signal the operator at the central office by lifting the receiver from the hook.

She says, "Number, please?" We tell her the number. There is a wire that goes from our house to the central office. The operator connects this wire with the one that goes to the telephone of the person to whom we wish to speak.

In many towns and cities all of this is done by machinery. In those places there are dial telephones, and we do not have to tell an operator what number we want. The dial has numbers printed on it. We turn the dial to the right numbers and a machine connects the wires just as an operator would.

This is a telephone office where calls are made to other countries and to ships at sea. The names of the countries and ships are printed at the top of the telephone switchboard.

When we talk to someone in another town or country we make a long-distance call.

The telephone helps us in many ways. By using the telephone, men can talk about business easier than by telegram or letter. We can call the doctor, the police, or the fire department quickly if we need them.

Many workers help to give us telephone service and to keep the telephones working right. Men set poles into the ground and string wires on the poles. Men and women work in the telephone offices. There must be one or more operators in each office all night and all day.

Sometimes when it storms, poles are blown down and wires are broken. No one can talk over these wires until they are mended. Telephone men go out and fix the wires even when the weather is bad.

Telephone operators have often stayed at their places during fires and floods. It takes brave people at such times to keep our telephones in use.

The Wireless and the Radio

At first it was hard for people to believe that dot and dash messages could be sent over a wire. It was even harder for them to believe that people could speak to one another over a wire.

After the telegraph and the telephone had been used for some time, men began to wonder if they could send messages through the air without any wires at all.

About forty years ago, Marconi, an Italian, found a way to do this. He sent dot and dash messages through the air without wires. This was called wireless telegraphy. It is still used, mostly by ships at sea. They send messages to land and to other ships. They send and receive weather reports. They find their way on the ocean by using wireless. Many lives have been saved because of the wireless.

Then people found a way of speaking by wireless. This is what we call the radio.

The radio has made work for a great many people such as engineers, actors, and musicians.

People broadcast from studios. They speak, sing, or play in front of microphones. Sounds go out into the air from high towers like those shown on page 183. Electric waves travel through the air and carry the sound to our radios.

When we listen to radio programs, we hear sounds which seem real. Sometimes we hear dogs bark or roosters crow. We hear the sound of thunder or of wind.

These sounds are made by sound-effects men. The man in the picture is twisting straw to make the sound of an animal creeping through the grass.

There are radios in many homes all over the world. People like to listen to radio broadcasts.

Radio sets have changed very much since radio was invented a few years ago. At first people had to use earphones like a telephone receiver to hear the sounds. Then loud-speakers which looked like big black horns were used. But today loud-speakers are built inside the radio cabinets.

Radio will change even more in the next few years. Men are always trying better ways to do things. On the radio we can hear what people many miles away are saying. But men are now making receiving sets that let us see as well as hear the speakers, actors, or singers.

These sets are called television sets because with them we can see as well as hear the broadcasts. Some day most of us may have television sets in our homes.

Often in newspapers we see pictures of things that happened only a few hours before in some place far away. These pictures are sent by radio and by wire.

This picture was taken on the day when George VI was crowned king of England. It was sent to the United States by radio in less than an hour. Then it was sent by wire to newspapers all over the country.

Recording Speech and Action

When a man writes something he wants to keep, we say he records it. In this way his ideas are kept for himself and other people.

Some years ago a machine was made to record sounds. This was the phonograph. Music and people's voices can be recorded so that they may be heard again and again.

Thomas Edison invented the phonograph. It was called a "talking machine" because people could hear others talk over it. The records were not flat like the ones used today. They were round like a tube.

Since that time, records and phonographs have been made better. Now phonograph music sounds as real as if people were playing or singing in the room with us.

Records are made of a kind of wax which does not wear out easily. Electric motors turn the records. The old phonograph was turned by a spring. The spring had to be wound by turning a crank.

After radios were invented, people did not buy as many phonographs. They listened to radio programs instead of records. But now people have become interested in phonographs again. If we have a phonograph we can play records of our favorite music over and over. On a radio we cannot choose music in that way.

These are newsreel cameramen. They are riding on top of an automobile and are using their moving picture camera to take moving pictures of a parade.

Motion pictures record actions just as the phonograph records sounds. In motion pictures, people and things that are moving can be seen again and again.

A special camera is used to take many pictures quickly, one right after another. The pictures are taken on a film. This film is run in front of a light, and the pictures are thrown on a screen. People and objects seem to move, for the film runs so fast that we do not see the separate pictures.

Motion pictures are shown in theaters in nearly every city and town in the world. These pictures are more interesting now because a way has been found to record the voices of the actors and other sounds.

Motion pictures entertain us and help us to learn many things. We can see famous people and hear them talk. We can see beautiful parts of the world where we have never been.

Travel and Communication

The world seems very large to us. A few miles seem a long distance when people do not have good ways in which to travel and communicate. The men of long ago must have felt very lonely at times.

All this has been changed. Today people can go to one another quickly. They can send messages by letter, telegram, or telephone.

We can hear radio broadcasts and see pictures from faraway countries. We know that, even if the world is so very large, communication and transportation make the most distant people our neighbors.

People in other countries are learning more about us, and we are learning more about them. The people of the world are growing to understand each other better.

Transportation and communication are helping to make the world a better and a happier place in which to live.

The Transportation Prize

Bob are Bill are happy. They have just won a fine prize. When an automobile company asked boys and girls to write stories about how men learned to travel, Bob and Bill wrote the best story of all. The prize is a trip to New York City.

"We learned about the transportation of long ago at school," said Bob. "And now we are going to find out about the transportation of today. We are going to New York on a streamline train. We are coming back by airplane!"

"In New York we shall visit the great harbor and see the ships," said Bill. "And think of riding on the busses, taxicabs, elevated trains, and subway trains!"

Bob and Bill have just sent a telegram to their grandmother to tell her about the prize. Now they are telephoning their friends. But their friends already know about their good fortune.

It has been announced over the radio. Besides, there is a big picture of Bob and Bill in the newspaper.

With transportation what it is today, people can go anywhere quickly. With communication what it is, the boys could not keep people from knowing about their prize, even if they wanted to!